The Lean Bookstore

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ABSTRACT

The bookstore industry has been changing in recent years with the growing popularity of e-books and self-publishing. The publishing houses are losing their grip on the industry because a greater portion of books are being sold by companies who don't need to sell books to stay afloat, and overproduction is rampant, with 40% of all printed books being pulped. Bookstores have been suffering because of the high costs associated with the current value stream. E-books aimed to reduce these costs but have been cannibalizing their print counterpart and do not generate enough revenue to offset the loss of print sales. That being said, demand for books has not decreased in recent years and physical books purchased in bookstores are still the most common form of purchased literature. For the sake of consumers and the industry as a whole, there is a clear need for change.

"The Lean Bookstore" seeks to change the way books are sold by creating a new kind of bookstore that leverages point-of-sale printing and a simpler value stream to bring customers the best combination of price, selection, and customer service on any book, at any time. Currently, online is cheaper but you must wait; in store you can browse but you'll pay more; online has better selection but is difficult to browse; independents might have better service but less selection. Customers won't have to compromise anymore as all of these strengths are brought under one roof.

Through developing and analyzing four different bookstore models, the airport bookstore has the greatest potential because it reaches the largest market and has the most compelling value propositions. Our business is different from current airport bookstores because we have increased our selection of books by storing all of them digitally, reduced transportation and inventory costs, and will be able to provide better service through our reduced store footprint.

ACKNOWLEDGEMENTS

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INTRODUCTION

As the bookstore industry shifts its focus towards e-readers to keep up with the digital revolution, the inefficient model of the shopping mall-sized bookstore will soon become a thing of the past. Physical book sales are in a state of stagnancy and the bookstores are suffering, creating an opportunity for a lean bookstore model to take their place. This project seeks to analyze the most effective business models, and then use the findings from this project to supplement as a basic blueprint for an on-demand printing business. The significance of this work lies in the possibility of a new era of bookstores, where overhead is dramatically reduced and books can be printed in minutes at greater convenience to the customer. Who uses this product, business model, or machine depends on which route is pursued based on the results of this research: engineering a book printing machine and licensing it to struggling bookstores, opening retail stores utilizing an engineered machine, or opening retail stores utilizing a machine sourced from another company. Depending on the route chosen, the target market may vary. If it is decided to license the machine to bookstores, then the target market will be bookstores, both chain and prominent independents. If starting a retail chain is pursued, then the target market will be Millennials and other early adopters, but will shift to the entire book buying market as this type of bookstore gains market acceptance.

Owning a brick and mortar bookstore is a tough business. Overhead costs are extremely high because bookstores require a huge retail space, which means higher rent, utility, maintenance bills, huge inventories, which leaves most of the business' cash tied up, and more employees, which means more salaries and higher managing costs. In addition, books are frequently overstocked and sent back to the publisher, making for an inefficient business model. But these inefficiencies do not only affect the bookstores; consumers are the ones who are paying for it. Bookstores are going out of business because they are not profitable, leaving fewer physical storefronts for consumers to shop at and forcing them to buy books through other

mediums, such as online, on an e-reader, or in a department store. Consumers are losing the browse-and-buy experience that was once the only way to find a book, and, as a result, the average consumer is not exposed to a variety of literature and the number of books bought as gifts has dropped dramatically. Bookstores are forced to charge higher prices to cover their overhead costs, leaving the price-conscious consumer no choice but to buy a used book online and wait for it to be shipped to them. Due to the rise of e-books and online book selling, the brick and mortar business model is outdated and inefficient.

This does not mean that there is not a place in the market for physical bookstores anymore. In fact, market research shows that bookstores are still the most common avenue for a consumer to buy a book, although the figure has been dropping as the number of bookstores declines, as seen in table I. It's clear that having a physical storefront is valuable to consumers because, based on a survey administered by Simba Information, over 40% of book buyers say that they enter bookstores to browse and then buy from a competitor often or very often (Norris, 2012a). The reasons that bookstores are losing business vary depending on the consumer, but can summed up by several basic customer requirements that are not being met.

Table I. Sales Channel Trends

Table 4.1:
Overview of Book Purchasing Population
(U.S. Adults) Sales Channel Trends

	Winter 2011		Spring 2011		Summer 2011		Fall 2011	
	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers
Book Club	7,469	6.3%	7,567	6.4%	6,948	6.0%	6,452	5.6%
Bookstore	69,755	58.4%	70,075	59.6%	68,419	58.9%	68,044	58.9%
Online	30,526	25.6%	32,420	27.6%	32,667	28.1%	34,899	30.2%
Other	41,089	34.4%	37,719	32.1%	37,177	32.0%	35,114	30.4%

Note: Winter figures correspond to 225.6 million adults and to 119.4 million adults who have purchased any book(s) in the 12-month period, while spring and summer figures correspond to 225.7 million adults/117.5 million book buyers and to 225.7 adults/116.2 million adults who have purchased any book(s) in the 12-month period. Fall 2011 corresponds to 226.2 million adults and 115.5 million book purchasers.

Source: Experian Simmons, compiled by Simba Information

Bookstore customers tend to be relatively price-sensitive, so if they can find a better price, then they will purchase the book at the lower price. This is why there has been such a rise in the number of used books being purchased, and a contributing factor in the rise of e-books. Convenience is also an important factor for most book buyers, which, for a frequent book buyer, an e-reader has a clear advantage. However, for the majority of the market, a local bookstore holds the advantage because a consumer can get the book that they are looking for immediately. For nearly all book buyers, selection is a key requirement, which is why bookstores need to hold such a large inventory - if the book the consumer is looking for is not in stock, they will buy it somewhere else. Service is another requirement that brings book buyers and non-book buyers into bookstores. Having a knowledgeable staff to help consumers find what they are looking for and give recommendations is a huge value to consumers, and is worth the trip to the bookstore for many, even when they plan on purchasing the book elsewhere. A summary of the importance of each customer and business requirement is listed in table II below, with a ranking of four being the most important and one being the least.

Table II. Customer and Business Requirements

Customer Requirement	**Ranking**
Convenience	4
Selection	4
Price	2
Service	1
Business Requirement	
Inventory	4
Retail Space	2
#/Quality of Employees	4
Overproduction	2
Browsing Capability	3

There are several market research companies that closely follow the book retailing industry and produce several extensive marketing reports per year that focus on various aspects of the industry, such as “Trends in Trade Book Retailing”, “Business of Consumer Book Publishing”, and “The US Market for Religious Publishing and Products.” The major companies that exist are Simba Information and Packaged Facts. Simba Information focuses exclusively on the publishing industry, and has been reporting on the industry for over 40 years. They produce

independent reports that focus on nearly every aspect of the industry, from children's books to bestseller trends. Using primary and secondary research, they capture trends and important industry data with reliable statistics that will be extremely useful as market size and consumer behavior is translated into financial projections for the business models. Packaged Facts produces reports on a variety of topics, but does have several reports that apply to this project, mostly in the form of target market analysis. They use primary and secondary research as well, and offer insight on the trends that they see occurring in the industry.

The product that currently exists for on demand printing is called the Espresso Book Machine (EBM) and is a product of OnDemand Books. The machine is 64" x 35" x 81" and can print a perfect bound paperback book at roughly 100 pages per minute. The books can range in size from 4.5" x 5.0" to 8.25" x 10.75" and can range in page count from 40 to 830. The digital catalogue of books is called EspressNet and holds over seven million titles, including books from GoogleBooks, various major publishers, and self-published authors (*Espresso Book Machine: A Zerox Solution*, 2013). EspressNet also manages the purchase of books on any EBM, including royalty payments to the content owner. The EBM has the basic technology and capabilities of a machine that would be required to put into a retail store that focuses primarily on on-demand-printing because it can print quality bound books quickly at relatively low cost and has a digital server where all of the titles can be stored and purchased. However, the major problem with the EBM right now is that the machine needs the rights to more titles. The majority of the titles on EspressNet right now are free books, so more deals must be made with publishers for mainstream titles. Also, from speaking with an operator of the EBM, it has been learned that the machine and software still has some bugs to be worked out before it becomes a reliable printing machine. A more consumer-friendly user interface that makes books easier to find and facilitates browsing would be needed as well. As the technology continues to be improved, it would be expected that books continue to be printed faster and color printing to be available on the interior pages as well.

Through this senior project, the goal is to research the existing technology and competitive landscape to develop the best strategy for a print on demand bookstore. The key deliverable from this project will be a recommendation for the most feasible business model,

chosen from the business models that have developed and analyzed in this project. The areas of the business models that will be analyzed and projected are: target markets, store layout, branding, technology integration, and key financial metrics. Barriers to entry and potential challenges with market acceptance and technology for each model will attempt to be predicted as well. To do this, two of the tools that will be used are primary research, in the form of surveys, and statistical analysis on the collected data.

Objectives:

a) Develop several bookstore models that leverage market trends and improved cost structures.

b) Use primary research to predict performance.

c) Analyze the collected data using statistical analysis.

d) Recommend the most feasible business model.

This project is potentially valuable to publishers, existing bookstores, entrepreneurs looking to start a bookstore, and book buying consumers. Publishers can benefit from this research and analysis by understanding the implications of current industry trends and how to add a new sales channel that will potentially give them more power over their content. Existing bookstores can use the analysis presented to understand potential ways to adapt to consumer and industry trends, and how to utilize new technologies in their current businesses. An entrepreneur can use this report as an initial roadmap as they seek to validate the business model in the marketplace. Consumers will benefit from this project because, regardless of whether it is used in a new or existing business, this research is aimed at utilizing new technology in a stagnant industry to deliver a more cost effective way of putting books in the hands of consumers.

The scope of the project will include the research and analysis of existing business models, and then the formulation of a new model for us to pursue going forward. Having said that, the scope will not include starting an actual business, selling product, seeking investment, or even developing technology. A variety of key things will need to be accomplished to be able to create a new business model to pursue, including taking steps to place the team in an incubation program like the Hatchery on campus, appropriate literature review and analysis of book selling avenues, and adhering to milestones mentioned in the Gantt chart. For instance, an IP expert was

consulted to gather the information necessary to wrap up the IP research section of the Gantt chart by November 4th, thus completing Task three of the five main tasks and moving closer to the project finish date of February 28th.

SECTION II
LITERATURE REVIEW

The purpose of the project is to explore the feasibility and potential of several bookstore business models that utilize on-demand printing as the primary method to produce books. The main areas that will be addressed are barriers to entry, overhead costs, and product costs, as well as potential markets and revenues. In order to be able to generate and understand these numbers, it is important to understand the industry, trends, and competition that the proposed business will be entering. Benchmarking the proposed business models against current industry leaders will give a reference point that will allow the potential success of the business to be gauged. That being said, the literature review is targeted at understanding the current financial health of the industry, consumer habits, as well as the cost structures of the main competition and their target markets. Current trends in book buying will be examined to understand the future of the industry and where areas for growth exist. In addition, the capabilities of current on demand printing technologies will be examined and how they could be used or adapted to fit a print on demand business model.

Industry Overview

The bookstore industry has annual revenue of $60 billion worldwide and $11 billion in the US, according to MarketLine, and a revenue of $14 billion according to Simba's estimates (Hoover's, 2013). There are approximately 9,500 physical bookstores in the US, with the main booksellers consisting of chain "superstores," independent bookstores, department stores, and online retailers. The industry is highly concentrated, with 50 largest of these companies accounting for 85% of sales in the industry. Average annual sales per employee is $115,000, meaning that the industry is labor intensive. Across the industry, gross margins average 37.5%, but operating income is only 1.0%, with net income at just 0.1% (First Research, 2013). The numbers show that the products can be profitable, but the cost of operating the business is too high, allowing bookstores to barely break even.

Average inventory accounts for 50% of the bookstores' assets because bookstores are forced to hold high inventories to ensure that they have the products that consumers are looking for, exactly when they are looking for them (Hoover's, 2013). One positive note for bookstores is that unsold books are usually able to be returned to the publishers for a full refund, which means that publishers are the ones who are absorbing this cost. However, there are still costs associated with purchasing these books, handling them, holding them as inventory, and then sending them back, which an on demand printing bookstore model would eliminate.

According to Hoover's, "The typical bookstore customer is a highly educated, relatively affluent, married woman." Statistically, women purchase more books than men, and book buying increases with education and income, but book buying occurs in nearly every demographic. As seen in table III, just over 50% of the US population buys print books at least once a year, and 20% of the population is e-book buyers (Norris, 2012a).

Table III. Consumers' Book Purchasing Trends

Table 2.1:
Overview of Book Purchasing Population (U.S. Adults)
Consumers Who Did/Did Not Buy a Book in Previous 12 Mos.

	No. of U.S. Adults Overall (000)	No. of U.S. Adults Who have purchased book(s) in prior 12 months (000)	% of Adults who have purchased books w/in last 12 months
Fall 2007	216,995	118,131	54.4%
Winter 2008	216,950	118,442	54.6%
Spring 2008	218,657	119,280	54.6%
Fall 2008	220,172	120,243	54.6%
Winter 2009	220,091	122,859	55.8%
Spring 2009	221,841	124,808	56.3%
Summer 2009	221,182	126,912	57.4%
Fall 2009	222,896	127,802	57.3%
Winter 2010	222,091	126,476	56.9%
Spring 2010	222,622	123,807	55.6%
Summer 2010	223,483	121,495	54.4%
Fall 2010	223,765	118,819	53.1%
Winter 2011	225,638	119,378	52.9%
Spring 2011	225,702	117,497	52.1%
Summer 2011	225,747	116,249	51.5%
Fall 2011	226,276	115,473	51.0%

Source: Experian Simmons, compiled by Simba Information

The percentage of US book buyers has been trending downwards recently, which can be attributed to the loss of physical stores, as well as the marketing strategies employed by major book sellers. The marketing strategies that have been used in recent years, such as Barnes and Noble Member Program and Amazon Prime, target heavy book consumers, as do e-readers. The kind of person who is going to want a dedicated e-reading device is someone who purchases enough books for the lower cost of the books to offset the cost of the e-reader, not your average book buyer who only buys a few books a year. Of the 120 million US adults who purchase books, 58.9% purchase from bookstores, 30.2% online, 30.4% from department stores, and 5.6% from book clubs, according to Fall 2011 numbers as seen in table IV. During the same time period across all channels, roughly 80% of book buyers purchased paperback books, 55% hardcover, and 51% purchased a book as a gift, as shown in table I in the appendix. Table II in the appendix shows that 13.7% of book buyers are "heavy buyers" of paperback books (10+ per year) and 4.6% are "heavy buyers" of hardcover books, meaning that the majority of consumers are more casual buyers, 56.3% and 44.9% respectively (Norris 2012a).

Table IV. Overiew of Book Purchasing Population

Table 4.1:
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(U.S. Adults) Sales Channel Trends

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Online	30,526	25.6%	32,420	27.6%	32,667	28.1%	34,899	30.2%
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History of the Competitive Landscape

During the 1990's, chain bookstores were focused on expanding their superstores because they did not see Internet retailing, specifically Amazon, as a threat. These superstores were gaining huge market share so they continued to expand, but they were doing so at the expense of the independent bookstores. As Amazon gained market share, department stores entered the mix and began to carry popular books and bestsellers, but this was generally ignored since the bookstores were still experiencing strong growth.

With the economic downturn in the early 2000's, the chain bookstores began to close down their smaller storefronts because the revenue per square foot and operating profit couldn't match their superstores. Borders' went through several changes in leadership in a short period of time and each time created a new strategy on how to deal with these small storefronts, but Barnes and Noble was able to eliminate their small storefronts by 2011. Borders was drawing 13% of their revenue from these stores, while Barnes and Noble was drawing only 2%, which is why Borders was hit much harder by this loss. The two chains entered the e-commerce space in two different ways as well; Barnes and Noble set up a separate entity and later pulled it in as part of the main company, but Borders partnered with Amazon to handle their web sales, losing a large share of their customer base to Amazon. Meanwhile, the department stores were stealing the consumers who only bought a book every once in awhile, which made up a huge share of the market. These department stores were able to price books as loss leader items because they did not rely on book sales for their existence, and became the convenient place to buy a book as more and more bookstores closed down (Norris 2012b).

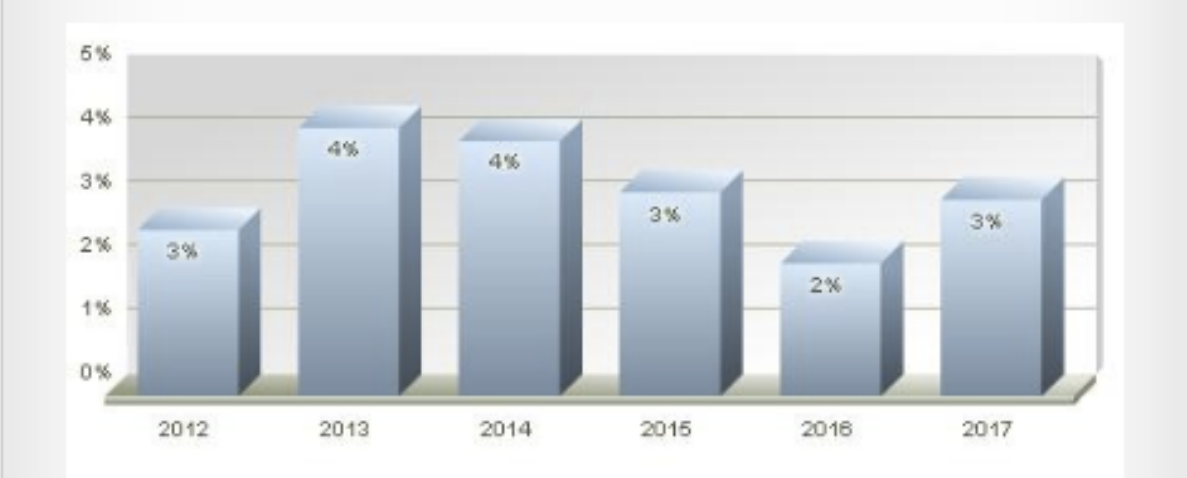
With the advent of Itunes, bookstores lost the revenue they used to get from music, leaving Borders' tagline, "Books and Music," meaningless. As e-books gained public acceptance, they began to steal revenue from their print counterparts because they are less expensive and come out at the same time. The digitization of content began a trend for bookstores to become showrooms for readers to find out what they wanted to buy and then go home and buy it on their e-reader.

Today, there are two major bookstore chains left in the US, Barnes and Noble and Books-A-Million, since Borders went bankrupt in 2011, and Amazon is the e-commerce giant of the industry. Barnes and Noble has now focused on their superstores and college bookstores, as well as their NOOK e-reader. Barnes and Noble is the largest bookseller in the US, with $7.2 billion in revenue in 2012. Books-A-Million stores are mostly located in southern states and, unlike Barnes and Noble, are continuing to expand, mostly in response to Borders liquidation. However, they are much smaller, with revenue of $453 million in 2012. Amazon, the internet giant, had media revenues just shy of $18 billion in 2011, and have not only been selling print books, but have been gaining market share with the Kindle e-reader, offering programs such as the Kindle Lending Library to get more consumers to purchase an Amazon Prime membership. In addition to books and e-books, Amazon has been delving deeper into publishing, with several self-publishing programs, such as CreateSpace and Kindle Direct Publishing, and has purchased publishing houses to build up the Amazon Publishing division. Clearly, Amazon has a lot of power in the industry and is looking to continue to expand their market share.

Industry Trends

According to Hoover's, "US personal consumption expenditures on books, magazines, and newspapers are forecast to grow at an annual compounded rate of 3 percent between 2013 and 2017," as seen in figure I(Hoover's, 2013).

Figure I. Projected Industry Growth Rate



However, sales have been increasingly moving online, with only half of revenue still coming from physical retail locations. The digital revolution is clearly taking hold of the industry, and it is important for bookstores to be successful in this channel if they wish to be a strong force in the market, as we saw with Borders and Barnes and Noble. While the digital trend is the most obvious, there are several other industry trends that are affecting bookstores that can hurt store sales or can be used to gain an advantage, if understood and applied correctly.

Between 2002 and 2012, pricing for trade books remained flat, as seen in tables III and IV in the appendix, as set by the publishers, making it difficult for bookstores to maintain their margins unless they increased volume, decreased discounts, or decreased overhead expenditures. This has caused many shopping mall bookstores to be closed down because the profitability of these stores declined as traffic to these stores decreased, and the superstore model proved to be much more profitable. Another difficulty that bookstores have been experiencing is seasonal cash flow. During the holiday and back to school season, bookstores generate most of their revenue and profit for the year, so if they have a slow winter season then the entire year is greatly affected. Not only must the winter season be capitalized on, but promotions and other efforts must be used to bring consumers into the store year-round.

Department stores, such as Costco, Target, and Walmart, have increasingly begun to sell books and now have a commanding market share. As seen in table IV, over 30% of book buyers have purchased a book from one of these stores because, while only bestsellers are sold through this channel, it is convenient and often less expensive than buying the same book from a bookstore. These stores are able to price the books as loss leader items to encourage customers to come into the store, but this is taking business away from bookstores and devaluing books overall as consumers come to expect lower prices. Bestsellers drive the infrequent consumer to bookstores, so by stopping a consumer from making the trip to the bookstore, they only buy the one bestseller that they were looking for and do not browse or make impulse purchases on books. If publishers or booksellers wish for the industry to grow, they must manage the relationship that customers have with buying books from non-booksellers and increase the value that bookstores are able to offer. One way that they are able to offer more value is by having well-trained, knowledgeable staff, which is currently not the case for most chain stores. Having a helpful and

friendly staff that is able to offer recommendations and improve the customer's shopping experience is becoming a must as bookstores face greater competition.

The price sensitivity of consumers can also be seen in the growing popularity of used books. Amazon is the clear leader in this area, as they can buy and sell books between consumers from around the world at prices as low as one penny. This is devaluing books in consumers' eyes and not allowing authors and publishers to collect money for their work. As you can imagine, physical retail stores have been hurt by this trend as well, but several large chains have emerged, such as Half Price Books, that primarily sell used books at steep discounts. Half Price Books revenue grew 8% to $220 million in 2010, and other brick and mortar stores are rapidly expanding into this space (Rosen, 2012). It is clear that their success is proof that even price conscious consumers do prefer to shop in store and purchase physical copies of books.

Bookstores have also been increasing the amount of space that they dedicate to non-book items, such as gifts, children's toys, and coffee. These products offer incremental revenue and can often be used to bring consumers into the store with brand names, such as Starbucks or Seattle's Best. By offering these items, stores can offer consumers additional value that they won't be able to find online or from an e-reader. Specialty bookstores have been succeeding, not only in offering non-book items, but in specializing their selections to target certain markets, such as religious, and offering a greater depth of books in that given area than a consumer would be able to find anywhere else. Another specialty service that has been gaining popularity is proprietary publishing. With the explosion of self-publishing, authors are realizing that they don't have to go through big publishing houses to get their work published, and bookstores are capitalizing on this by allowing authors to publish straight through them, and gain more attractive margins in the process.

Brick and mortar stores can also act as a community events center, hosting events and connecting people with similar interests. By identifying with consumers in this way and responding to their needs, bookstores can gain customer loyalty in an industry where this traditionally does not exist. College bookstores have been effectively doing this and growing rapidly as a result. They are able to provide local students with exactly what they need, and they

do it more conveniently than any other channel. There is still more room for growth in this area because “full-time college enrollment is projected to rise nearly 10 percent between 2010 and 2017” (Hoover’s, 2013).

Amazon

In 2012, Amazon’s revenue totaled over $61 billion worldwide, with nearly $20 billion of that coming from media. According to Morgan Stanley estimates, Amazon will sell $4.5 billion worth of Kindle e-readers in 2013 and $3.8 billion of digital media (Del Rey, 2013). These numbers are projected to continue growing in the coming years as this online giant seeks to dominate the market. The e-reader revolution has taken hold and it is changing the way physical book carriers model their businesses. Since the start of 2012, for every 100 physical books ordered by Amazon clients, there have been 114 e-book downloads (Milliot, 2013). In the same year, the e-book division outgrew Amazon’s paperback sales 70% to 5% (Barnes & Noble, 2013). Across the pond, UK bookstore, Waterstones, reached a deal with Amazon to put Kindles in their stores so customers can browse the physical bookstore while also having the option to buy a Kindle (Lea, 2012). Additionally, the deal requires all Waterstones to have Wi-Fi access so that customers with Kindles can have access to e-books.

Amazon is unique in that they can sell new physical books, used books, e-readers, e-books, and offer publishing services as well; they are quickly becoming a force in every area of the industry. They have approximately 57,000 employees worldwide, operate 89 fulfillment centers as of May 2013, and 30% of their business comes from third party sales (Amazon, 2013). The typical margins Amazon makes on its new books are about 30% and slightly lower for used books, but Amazon has been known to sell its e-books at a loss in an attempt to gain market share. While they can afford to do this now, as they continue to expand and their fixed costs grow, they will have to begin charging more for shipping and Amazon Prime, which they are already losing money on (Streitfield, 2013).

There are several advantages that Amazon’s business model has in terms of bookselling, but there are several disadvantages as well. Because of their size and scale, Amazon is able to offer consumers great prices on their products, especially e-readers and used books. Also, they

do not rely on book sales as a company, so they are able to sell them at a loss to gain market share if they choose to. They have been expanding their fulfillment center footprint, which reduces their shipping costs and allows them to put products in consumers' hands faster. Being an online retailer and combined with their one-click ordering method, they offer extreme convenience by allowing consumers to have what they want show up at their door, without ever having to leave the house or set foot in a store. They do not experience the same inventory constraints that physical retail stores experience, so they are able to have a much greater selection.

The disadvantages that online businesses like Amazon face in the marketplace are that it's harder to build customer loyalty and they have no physical storefront. Having no physical storefront means that consumers have to wait to receive product, can't browse in person with tangible products, and the customer shopping experience is much different. Amazon recognizes these problems and is making attempts to combat them, such as Amazon Prime and selling Kindles at a loss to build customer loyalty. They offer free two day shipping on many items and allow the user to look inside a digital version of the book to improve the shopping experience, but it still does not match a physical bookstore. Overall, they cannot provide additional value to consumers in the same way that a local store can.

Barnes and Noble

Barnes and Noble is the largest bookstore chain in the US and had nearly $7 billion in sales in 2013, but, unfortunately, they lost $158 million on those sales (Hoover's, 2013). They operate 1,361 stores in the US, with roughly half of them being retail and the other half college bookstores, as seen in table V. Their retail locations brought in 64% of total revenue, with 25% from college locations and 11% from the NOOK product line. The company's gross profit margin for the year was 25%, but goes negative once operating expenses are taken into account. If this is broken down further, it can be seen that their retail margins were 30%, 23% for college stores, and -24% for the NOOK (Barnes & Noble, 2013). The NOOK is failing to meet expectations, but, from this breakdown, it can be seen that Barnes and Noble can operate a bookstore profitably; the reason for their huge losses is because they are spending a large amount of money as they try to break into the e-reader market.

Table V. Barnes and Noble Stores

Table 3.6:
Number of Superstore Outlets, 2007-2011

Bookstore Chain	2007	2008	2009	2010	2011	Change, 2010-2011	Change, 2007-2011
Barnes & Noble total[1]	798	778	1,362	1,341	1,338	-0.2%	67.7%
BN superstores	713	726	719	705	691	-2.0%	-3.1%
BN College	--	--	639	636	647	1.7%	
B. Dalton	85	52	4	0	0	--	--
Borders total[2]	998	901	683	642	0	--	--
Borders superstores	509	515	508	489	0	--	--
Waldenbooks	489	386	175	153	0	--	--
Books Etc.	0	0	0	0	0	--	--
Books-A-Million total	208	220	223	231	257	10.1%	23.6%
Superstores	184	200	201	201	204	1.5%	10.9%
Small format stores	24	20	22	20	53	62.3%	120.8%
Total, 3 chains	**2,004**	**1,899**	**1,629**	**1,578**	**948**	-66.5%	-52.7%

[1]Barnes & Noble acquired B&N College on September 30, 2009. *College not reflected in 3 chain totals*
[2]Borders total is domestic stores only. Books Etc. stores were part of international business sold in 2007, and the chain liquidated in August 2011.

Sources: Simba Information, from company financial reports

Barnes and Noble's average store size is 26,000 square feet, but they range anywhere from 3,000 up to even a massive 60,000 square feet (Barnes & Noble, 2013). These superstores are able to carry large inventories and stock up to 170,000 titles in a single location. They have phased out their smaller stores and focus on the superstore format because it is more profitable for them; sales average between $250 and $350 per square foot and can generate over $5 million in revenue annually. These stores typically have a manager, two assistant managers, and between 20 to 50 full and part-time employees (Hoover's, 2013).

Barnes and Noble attributes its success as a bookseller to several key factors. Their physical locations are convenient for customers because they are placed in high-traffic areas, offer plenty of parking, and generally have extended shopping hours seven days a week. Because of the size of their stores, they are able to offer an extensive selection in store, as well as an even greater selection online (14 million titles in their database) or through the NOOK. They operate in all three of these channels, allowing them to identify with more customers, no matter what

their shopping preference is, and gives customers more convenience and choice. Barnes and Noble's store design seeks to create a spacious, comfortable atmosphere that offers additional services, such as a cafe, toys and games department, music/DVD/BluRay department, and educational tools, to serve as a community meeting place. Another way they seek to be a community-meeting place is through the events that they hold. Each store plans author appearances, children's storytelling hours, and discussion groups based on its specific community to encourage customer loyalty. They are using their physical stores to sell and promote the NOOK in ways that Amazon can't. The NOOK has a dedicated area in most stores where customers can see, feel, and experiment with the e-reader, as well as receive pre- and post-sale support from knowledgeable booksellers. Barnes and Noble does its best to give customers the best value by taking 30% off of suggested retail prices for bestsellers and 20% off certain titles in other categories.

Independent Bookstores

There are over 1,400 independent bookstore locations in the US, which approximately matches the number of chain stores, but independent stores only control 5% to 10% of the market (Norris, 2012b). While they are arguably the most important bookseller for the industry because they live or die based on their ability to meet consumer's book buying needs, they have been under tremendous pressure in recent years from bestsellers being sold at a loss by departments stores, smaller margins, and rising rent. Independent bookstores seem to attract or create a more engaged book buyer; their typical customers purchase six to nine books per year and those who purchase one to five are the least common. Most independent stores use social media and websites with an e-commerce capability to attract and keep customers and many have begun to sell e-books as well. While their e-book sales may be insignificant in comparison to Amazon or Barnes and Noble, the continued improvement in this area will be important for any book retailer who wishes to remain competitive in the market.

The store layout of independent stores is very different from their chain counterparts. A typical independent bookstore doesn't exceed 5,000 square feet, which means they don't have all of the additional departments and services that a chain might have, so most of their revenue comes from selling books. They generally average $1 million in revenue or less, which comes

out to roughly $330 per square foot. The owner generally serves as the manager of the store and the store staff tends to be more experienced and knowledgeable, due to lower employee turnover. While most independents do have a website that they can sell books through, they often outsource this to a third party provider, like Booksite.com.

An independent bookstore is preferred by some consumers because they offer more personal service than other book retailers. Their staff is generally more knowledgeable and they are able to form relationships with customers because there is less employee turnover. They are able to more closely customize their selection to the needs of their local market or niche, and really be the neighborhood bookstore. Unfortunately, they are at a disadvantage when it comes to price because nearly every other retailer can price books lower. In general, independent stores have less selection because they carry much smaller inventories, but their selection is often very specialized and has titles you would not find elsewhere. And although independent bookstores have websites and are beginning to carry e-books, the platform and usability of site are extremely important and they often fall short of the big companies who have more resources to devote to website development. 88% of book buyers who have used the internet to buy a book in the last twelve months agree that they "return to web sites that make it easy to find what I need," which is why it is crucial for any book retailer to have an effective online sales channel as well (Norris, 2012b).

The Espresso Book Machine

As stated in the introduction, the Espresso Book Machine (EBM) is a product of OnDemand Books that prints perfect bound paperback books in a few minutes. The digital catalogue of books is called EspressNet and holds over seven million titles, including books from GoogleBooks, various major publishers, and self-published authors (Zerox, 2013). EspressNet also manages the purchase of books on any EBM, including royalty payments to the content owner, and it is OnDemand Books' long-term goal to have every book that has ever been published available on their machine. The machine can be seen in figure II below.

Figure II. Espresso Book Machine

Currently, books printed from the EBM follow the agency pricing model, meaning that the publisher sets the price. Ideally, the store would like to control prices so that it can offer customers the best deals. A short-term approach could be to gain rights to all of the content of a certain genre or topic, so that the business could appeal to a specific target market until a wider selection of titles are acquired.

The EBM has the basic technology and capabilities of a machine that would be needed for print on demand retail stores because it can print quality bound books quickly, at relatively low cost, and has a digital server where all of the titles can be stored and purchased. However, the major problem with the EBM right now is that the machine needs the rights to more titles. The majority of the titles on EspressNet right now are free books, so more deals must be made with publishers for mainstream titles. They currently do not offer any leasing options, so the machines must be purchased outright for $85,000 each.

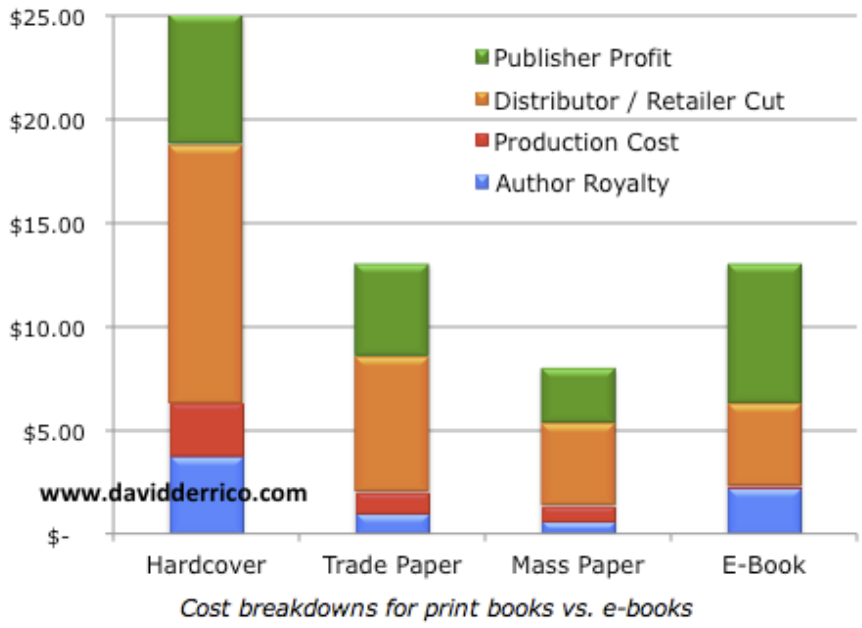
Cost Breakdown of a Book

In table VI below, all prices are the median price for a typical, copyrighted 200 page book. A visual representation of this data can be seen in figure III.

Table VI. Cost Breakdown of Book Formats

Type of Book		Author	Publisher		Bookstore		On Demand Books	Retail Price
		Profit	Printing Cost	Profit	Printing Cost	Profit	Profit	
Hardcover	Percentage	15%	9%	26%	-	50%	-	$26.95
	Dollar Amount	$4	$2.50	$7	-	$13.50	-	
Paperback	Percentage	8%	7%	35%	-	50%	-	$14.99
	Dollar Amount	$1.20	$1	$5.30	-	$7.50	-	
Mass Market	Percentage	8%	9%	33%	-	50%	-	$7.99
	Dollar Amount	$0.64	$0.75	$2.61	-	$3.50	-	
E-Book	Percentage	17.50%	1%	50%	-	30%	-	$12.99
	Dollar Amount	$2.27	$0.10	$5.15	-	$3.90	-	
EBM Printed	Percentage	8%	-	22%	20%	43%	7%	$14.99
	Dollar Amount	$1.20	-	$3.30	$3.00	$6.50	$1.00	

Figure III. Cost Breakdown of a Book



Cost breakdowns for print books vs. e-books

As can be seen from the cost breakdown above, an EBM printed book is competitive with other forms of books and the material cost will be reduced buying for a business. What is not seen is the additional cost to bookstores to source, carry, and discount each book (actual margins are 30% - 40% after discounts). The additional printing, distribution and pulping costs to publishers when 40% of their books do not sell (a weighted cost per book would be two thirds higher for each type of book) are not seen either. And from table VI, it is clear that e-books cut out the most cost, but consumers lose the ability to browse, which leads to more purchases. The

advantages of selling physical book over e-books are that consumers are willing to pay more for physical books because they value them more, which is positive for the industry, and they are much more likely to give them as gifts.

Conclusion

There are advantages and disadvantages to each current business model. Online stores are able to have lower prices, a better selection, and more convenience with minimal overhead, but do not have the physical locations to offer customer service/recommendations, and encourage browsing and gift buying. Chain bookstores offer good service and selection to encourage browsing, but the cost of running the business is too high. Independent bookstores offer great service, but do not have the size or scale to meet the needs of most of the market. By using one of the proposed business models, the aim is to make gains from both a consumer and business standpoint, as it will offer consumers a convenient bookstore that will always have the book they want in stock, right when they want it. It will offer the service of an independent bookstore because of its smaller size and browsing capability of a chain bookstore because of its selection. The following models will have greatly reduced overhead in the form of less inventory, a smaller retail space, and less employees. An overview of how these business models compare, from both a customer and business perspective, is shown in table VII below.

Table VII. Business Comparison

Rankings are 1-5, 5 being the best	Amazon	Barnes and Noble	Independent Bookstore	Department Store	On Demand Model
Customer Requirement					
Convenience	4	2	2	4	5
Selection	5	4	2	1	4
Price	4	2	1	5	2
Service	2	4	5	1	5
Business Requirement					
Inventory	3	1	1	3	5
Retail Space	5	1	2	4	4
#/Quality of Employees	5	2	3	5	3
Overproduction	2	1	1	3	5
Browsing Capability	3	4	4	1	3

The EBM is the technology of choice for our bookstore model because it can print any book in minutes as long as it has the rights, but the rights to more titles are still required in order to offer the selection envisioned. In addition, the store would like to be able to control the pricing

of each book to offer customers better deals and the browsing software would have to be improved.

SECTION III
ALTERNATIVES/SOLUTIONS

The extensive literature review was used to find out key industry information and to understand what it takes to successfully run a lean bookstore with the ability to print books on demand. Based off of what was discovered, four different business models have been created. While all of them are fundamentally based off of the same ideas, each of them is different in the target market the store will sell to and the overall feel of the store. Each bookstore model was broken down by brand, process, and financials. When determining how each model would be branded, the following factors were looked at: store layout, customer experience, presentation to the customer, the customer process, and customer interaction with technology. Due to the amount and length of financial data for each model, these supporting tables, figures and sketches can be found in the appendix.

Airport Store

The first of the four models is the airport store. The layout of this store would have to be compact to be compatible with what small space is available in airports. At the start, this model would feature one EBM at the back of the store; demand may necessitate a second EBM. The EBM(s) would be flanked by bookshelves along the walls. In the center of the store would be a table with up to five tablets for customer browsing of OnDemand Books' server for titles to print on the EBM. At the front of the store would be a shelf facing out to the public with samples of books printed within the store.

In terms of the store presentation to the customer, the store would be very well lit, featuring white walls with a tinge of blue for a neutral, quiet background. On the walls would be mounted wooden bookshelves, with small, concise genre labeling in matching wooden letters, going with the themes of neutrality and simplicity.

The customer process in the airport model will feature an Express Checkout for those in a rush; an attachment to the tablet will allow the customer to pay for an EBM-printed book straight from the tablet. In addition to this Express Checkout, the airport model's customer process will allow for the person casually strolling through the airport on a layover to wander into the store, pick up a tablet, take a seat, and browse through titles. This person can also find a knowledgeable staff member to discuss books with, or browse the selection of books on the shelves for purchase.

The customer's interaction with technology will include the aforementioned use of tablets for casual browsing of titles for printing on the EBM, and use of the tablets to pay for purchases with credit cards. Additionally, customers can watch their book being printed on the EBM, which will serve as an attention grabber to passersby. The customer will experience a friendly and helpful staff with an adequate knowledge of pre-printed books stocked on the store's shelves. The average customer will be able to come to this store to kill some time between flights, or buy a quick book if in a rush.

This model will appeal to travelers who want a book for their flight or trip and are dissatisfied with the limited choices currently available in airports. By storing titles digitally on the EspressNet Server, ideally any book will be available for print at conveniently located airport bookstores. This way, the model can serve the customer who buys books on impulse when faced with a surprise layover, while also serving the customer who plans on browsing around until finding a good book for their flight.

There will be one to two EBMs in a small airport storefront with one to three employees. Margins should be roughly 50% since we are not competing on price. Orders will be taken by a staff member through a store-provided tablet or through a mobile app. The product will be either pre-printed and on the bookshelves, or printed on demand by the EBM. Customers will be able to grab their book straight from the machine and be on their way.

Modernist Store

The modernistic bookstore model will be located where any bookstore can be found today, unlike the airport store. As a result, the layout of the store will be typical of those bookstores, but with a futuristic/modern twist. It will feature an open, spacious layout with plenty of seating and tables, and minimal amount of shelves. The goal of the layout is to look clean to maximize the effect and presentation of the store's technology. The store must look clean, efficient, and be without clutter.

The presentation to the customer will leave a lasting impression. It will have an atmosphere atypical of a bookstore, and more akin to what an Apple or Windows store is today: hip, technologically up-to-date, and above all, a cool, "connected" place to be. The walls will be white with a hint of bright colors to accentuate the open layout, and the walls will be without hard corners to highlight the EBMs and other technology in the store (tablets, etc.). The focus of the employees will be to assist the customers only, not manning the register or moving product, etc.

In terms of the customer process, the customer will be able to browse books and purchase online through a variety of ways: from the app, in store, or for pickup and for delivery. The customer will be able to connect to the EspressNet Server from their homes or mobile devices, as well as the in-store tablets. This gives the customer maximum connect-ability away from the store, as they can send books to the queue to be printed for pickup or delivery. They can see when their book has finished printing on the device or mobile app from which they placed the order on.

The customer will be able to take advantage of the store's technology in several ways. They can interact with the EBMs in store through the store's tablets or the mobile app on their own devices. There will be a self-checkout feature where a customer can swipe a card through an attachment to the tablets, or the customer can purchase on their own device with stored credit card information. Once the customer creates an account with the store, they can order books for pickup or delivery from anywhere. Also featured in the store will be the latest and greatest WiFi

connectivity; customers should have the ability to easily and quickly connect to fast internet at all times during their visit, once provided with a password by a staff member.

The overall customer experience will include a very knowledgeable staff combined with the EBM, readily available tablets, and a state of the art look and feel to the store. The bookstore of the future, this store will match age-old wisdom of the staff with new technology for a unique bookstore experience like nothing before.

This bookstore model will target Millennials and technology-savvy people who enjoy books and reading, or just like trying new things. This store will blend the best of digitization (e-readers and the internet) with the benefits of a physical storefront. The app and website will be crucial to this business given our target market, as we will need to build relationships with consumers through technology and connecting them with books they otherwise would not have discovered.

Ideally, the store will feature three EBMs. The store size (1,000- 1,500 sq. ft.) will require only five to eight employees. Since book prices are set by the publisher, the margins on books will be 40-50% per sale. In regards to the order-taking system, orders can be taken from the website, app, or in store from the tablets. For the product-delivery system, books can be printed immediately within the store and picked up on the spot, stored for pickup at a later time, or be shipped to an address the same day upon request. The website and app will be the main mediums of product information communication, in addition to the employees. Several features such as in-app push notifications, emails, physical books in-store on the shelves, that recommend books in different categories on a weekly basis to keep customers interested and help them discover new content. The plan is to also introduce incentivized business functions, such as a 10% discount for user book reviews, to increase loyalty and help gain new customers, and a membership program that will compete with Barnes & Noble and Amazon.

Hybrid Store

The layout of the hybrid model will be larger (3,000 - 5,000 sq. ft.) than both the airport and modernistic models. This store will be a hybrid in the sense that roughly half of the store will be

devoted to pre-printed books on shelves, while the other half will be space for EBMs, and a lounging area with tablets, tables and seating. The layout will resemble more of a typical bookstore that currently exists compared to the other proposed models.

In regards to the presentation of the store to the customer, the store design will be simple. It should look and feel similar to an independent bookstore (which offers physical browsing) with the added benefits of the EBMs and tablets. Just like every other model proposed, this will feature a friendly and knowledgeable staff. As for the customer process, the customer can walk into the store, browse, and make purchases just as if at a normal bookstore. Also, the customer can browse the EspressNet Server on the tablets or mobile app, and make a purchase on the EBM. EBM purchases can be made from home, on the go, or in the store.

The customers interact with technology in the hybrid store model when using the tablets or EBMs in the store, by using their own devices (mobile app), and can access everything from home so long as they create an account with the store, enabling them to order books for print and pickup or delivery. With this model we are targeting people who already enjoy shopping at bookstores, but are looking for a better local bookstore or a novel experience. This store will be very similar to the bookstores that exist now, except with the added benefit of having an EBM. Since this model will be very similar to other bookstores that they are already familiar with, it will not be as difficult to gain acceptance, but it will be much harder to differentiate from the others. The store will feature two EBMs and will require six to nine employees because of the larger store footprint and the greater amount of inventory that must be handled. Because prices are set by the publisher the margins on books will be 40-50% per sale.

For this store, consumers will be able to browse and purchase books off the shelves, or browse the EBM on their own device or store provided tablets. Orders can be taken from the website or in store from the tablets, but the app will most likely not be a focal point for this model. For the product-delivery system, books can be printed immediately within the store and picked up on the spot, stored for pickup at a later time, or be shipped to an address the same day upon request. The employees and website will be the main mediums of product information communication. The plan is to introduce incentivized business functions, such as a 10% discount

for user book reviews, to increase loyalty and help gain new customers, and a membership program that will compete with Barnes & Noble and Amazon.

Minimalist Store

The minimalist bookstore model will be the smallest and most basic of the proposed stores, and will be able to be found in many places where there may not already be a bookstore. The store layout and presentation will be simple, with an area for the EBM, another for bookshelves, and a small area for seating with tablets to browse. The store will not have a lot of extra features, but will instead focusing on everything that a customer is looking for in a bookstore and nothing more.

The store will feature a friendly and knowledgeable staff, which will be very important to this model, since the store does not offer very many other extras. The customer interaction and experience with our employees will be crucial in retaining a strong customer base. Due to the smaller size of the store and less features, customers will most likely spend less time in the store than the other proposed models, and will often come in to quickly grab a book and go. The customer will be able to browse the EspressNet Server on the tablets or mobile app, and make a purchase on the EBM. EBM purchases can be made from home, on the go, or in the store once they have an account with the store.

This model is targeting Millennials and tech-savvy people who enjoy books and reading, or even just trying new things. The model aims to blend the benefits of digitization with the benefits of having a physical storefront. Both the app and website will be crucial given the target market, as the model necessitates building relationships with consumers through technology and connecting them with books that they want to read and otherwise wouldn't have found. There will be one EBM machines in a small bookstore (500 - 1,000 sq. ft.) with two to three employees. Prices are set by the publisher currently, so are margins are 40-50% per sale.

For this store, consumers will be able to browse and purchase books off the shelves, although there will be limited selection pre-printed, or browse the EBM on their own device or store provided tablets. Orders can be taken from the website, app or in store from the tablets, in

addition to assistance from employees. For the product-delivery system, books can be printed immediately within the store and picked up on the spot, stored for pickup at a later time, or be shipped to an address the same day upon request. The website, app, and employees will be the main mediums of product information communication. The plan is to also introduce incentivized business functions, such as a 10% discount for user book reviews, to increase loyalty and help gain new customers, and a membership program that will compete with Barnes & Noble and Amazon.

Statistical Testing/Performance Verification

For statistical testing, it was decided to target the least defined variable: the number of EBMs needed in each store. To do this, the financial projections built from market and consumer statistics were taken and used to structure a Monte Carlo simulation to account for the variability in customer demand and more accurately determine the profitability of each model. The variables used in the simulation aimed to capture all of the sources of variability in serving the customers in a real world environment, where customer demand ebbs and flows and the store's ability to serve them is variable as well. It also takes into account that customers are not willing to wait indefinitely and that there is a cost associated with this wait time. Although it is not a hard cost, it was quantified with this simulation. Additionally, the cost of having an EBM sitting unused was quantified because it is very expensive to have an additional machine in the store. The variables inputted into the simulation were: customer arrival rate, EBM service rate, number of EBMs, the time each customer is willing to wait to be served, queued customer waiting costs, cost of losing a customer, and idle EBM costs, as can be seen in figure IV. For each simulation, the mean for these variables were defined, based on market statistics and known machine capabilities, and the simulation automatically generated one thousand random "events," which were either a customer arriving, purchasing a book, or losing a customer. The costs were automatically calculated, as well as the gross profit. A total of 23 simulations were run for the airport, modernist, and minimalist models. The simulation for the airport model with one EBM and pessimistic market assumptions is shown below in figure IV and the rest can be found in the appendix.

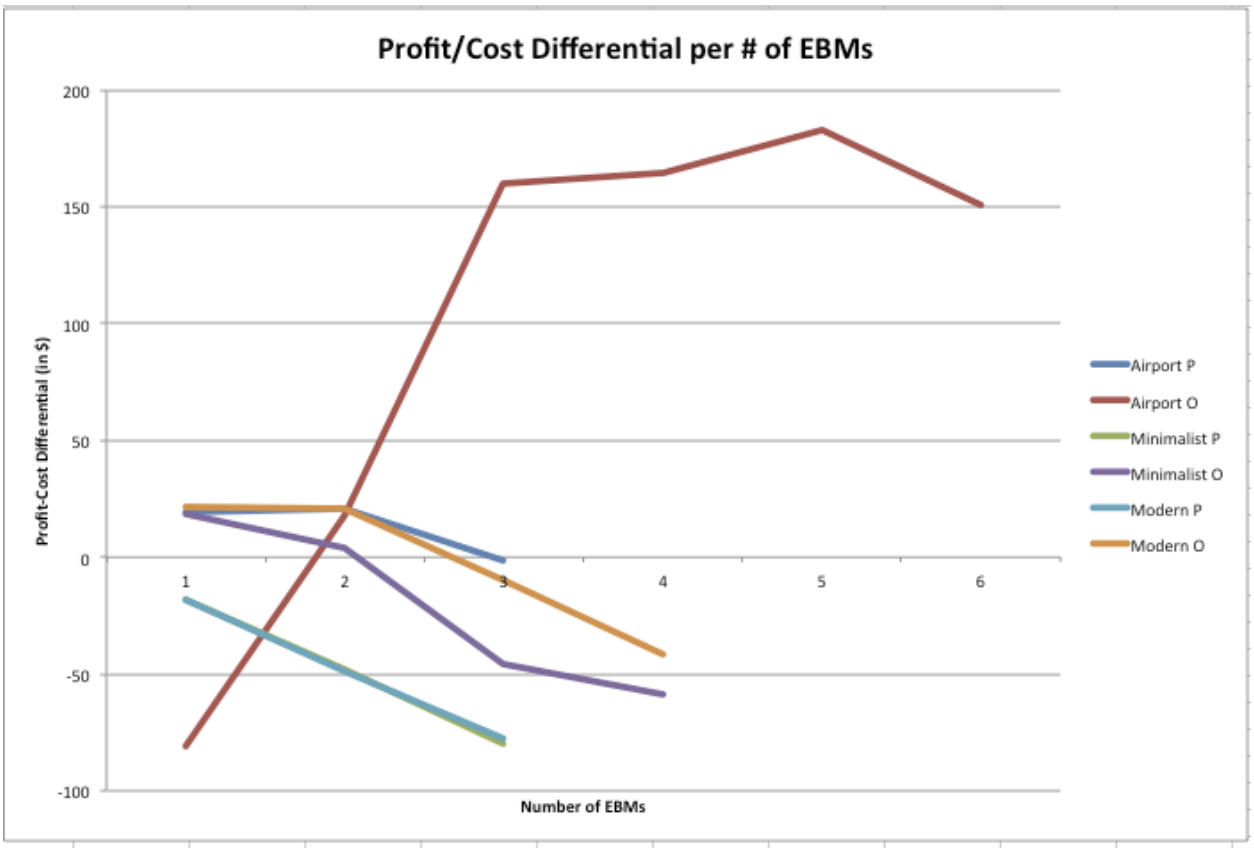
Figure IV. Monte Carlo Simulation – Airport Pessimistic One

Airport - Pessimistic 1								
Parameters								
10	Arrival Rate (customers per hour)			40k cust/350days/12 hrs				
12	Service Rate (customers per hour) per EBM			5 min/book				
1	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	1			1	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	10	0.45454545				
	Service	-1	12	0.54545455				
	Loss	-1	0	0				
			Sum of rates					
			22					
0.04545455	E (Waiting time until next transition)							
0.01528643	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	0						
			Average costs/hr in simulation					
		Total time simulated	Queue	Idle	Lost	Total Cost/hour	Total Gross Profit/hr	Difference
		49.21433393	3.45587355	10.928106	18.7750179	33.15899739	52.62694409	19.4679467
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	1	0.015286427	0	0	0	0		
1	5	0.013962818	0.27925637	0	0	0		
2	6	0.021576145	0.53940363	0	7	0		
3	5	0.119934993	2.39869986	0	0	7		
4	4	0.014223588	0.21335383	0	0	0		
5	5	0.007650832	0.15301664	0	0	7		
6	4	0.019461047	0.29191571	0	0	7		
7	3	0.05092554	0.5092554	0	0	7		
8	2	0.012758819	0.0637941	0	0	0		
9	3	0.105758727	1.05758727	0	0	7		
10	2	0.088275248	0.44137624	0	0	7		
11	1	0.022900682	0	0	0	7		
12	0	0.101269322	0	3.13934897	0	0		
13	1	0.00621433	0	0	0	0		
14	2	0.017357363	0.08678681	0	0	0		
15	3	0.021419639	0.21419639	0	0	0		
16	4	0.017612355	0.26418533	0	0	7		
17	3	0.006300107	0.06300107	0	7	0		

The outputs of this simulation are the one thousand random events, which can all be seen in the spreadsheet, the number of customers in the store at any given moment, the amount of time since the last event, costs broken up into three sections, and the profit every time a book is sold. The total time of the simulation is calculated, in addition to the total cost of queued customers, idle machine time, and lost customers, as well as profit from books sold. By taking the projected profit from the simulation and subtracting the associated cost, the inflection point

for each model was found where the profit was maximized, with both a pessimistic and optimistic market estimation, to find the correct number of EBMs, as seen in figure V.

Figure V. Number of EBMs Necessary for each Model



Tools Used

Various surveys were used from both primary and secondary research to understand consumer trends and pick a starting location. Pricing and business costs were researched to figure out startup and operating costs, and then a financial model was created to project profits based on the consumer statistics of the target market in a given area, which in this case is San Diego (retail models) and SFO (airport model). A statistical model was crafted to analyze the effects of having a different number of EBMs in stores and to find the optimal number of machines for each bookstore model. This allowed a more accurate prediction of profit and revenue, while accounting for variability in demand and service times.

SECTION IV
RESULTS

The purpose of this project is to develop multiple bookstore business models, evaluate them based on profitability and feasibility, and choose the best model. The team described and evaluated the Airport Store, Minimalist Store, Hybrid Store and the Modernist Store business models in the previous section, using statistical analysis to project profitability of each model. In the Results section, the team will discuss and breakdown the findings for each model based off of our statistical analysis, and choose the most profitable bookstore model. Additionally, key information that was obtained from surveying bookstore managers and experts working in the publishing industry was used to evaluate each model.

Airport Store

The major advantages of the airport store are the market size and market opportunity, while the disadvantages are higher rent and lack of return customers. With the airport store, the team is able to reach a much larger market because there will be constant traffic in front of our store from the travelers going through the airport. In San Francisco Airport (SFO), 44.5 million travelers pass through the airport every year, which is a much larger market than any other city to open a bookstore in. In addition to that, travelers are generally less price-sensitive at the airport and shop in stores between flights for books or games to keep them occupied during their flight or trip. There are very few options for buying books in SFO currently, and the bookstores that do exist in the airport do not have the selection that the airport model will be able to offer.

While the business will be able to reach a much larger audience, there will be very high rent for the amount of space that the store will be occupying. Additionally, because all of the customers are travelers and do not necessarily live locally, the percentage of return customers will be very small and the business will constantly be focusing on building new relationships,

rather than maintaining relationships with existing customers.

When these factors are taken into account in our statistical model, our yearly financial projections fall between $500,000 and $2,200,000 in revenue, with $40,000 to $740,000 in operating profit, not including startup costs. The final projections are $1,350,000 in revenue with $390,000 in profit.

Modernist Store

The main advantage of the modernist bookstore over the other models is its atmosphere. Relatively speaking, it will be armed to the teeth with relevant technology, including in-store tablet kiosks where consumers can go for title browsing, a developed mobile and the website app, and creative lighting features around the store. People will want to come here because of the environment within; much like an Apple store, it will be a cool place to hang out and read a newly purchased physical or e-book. Its disadvantages include increased overhead costs with the technology of the store, including maintenance of the mobile and the web apps. While the modernist store creates a unique and memorable bookstore experience for the consumer, it comes at a heavy price to own and operate.

Based on the team's analysis, the modernist model will have three employees, and one EBM. The yearly revenue for the modernist store model is projected to be between $89,000 and $469,000. After operating costs have been subtracted from revenue, in both optimistic and pessimistic outlook projections, there will be no profit; this model loses money in both scenarios. To be specific, you can expect the modernistic store to lose between $191,000 and $13,550. The final projections for this model are $279,000 in revenue and a $102,000 operating loss.

Hybrid Store

The advantages of the hybrid store are easy adoption from consumers and better customer experience. The disadvantages for this model are that it requires a larger retail space, more employees, and would be much harder to differentiate from other bookstores. Because the format of this store is the same as a traditional bookstore, consumers will not have to learn how to use the store and there will not be any education process, which means more consumers will be open

to using this kind of bookstore than one that they are not used to. Also, this model will be able to offer a better customer experience because it will have room for consumers to sit down, physical books for them to browse, and a bookstore experience that many people look for when buying a book. However, the added space requirement of this model raises the rent cost and requires the store to have double the employees as one of the other bookstore models. This added cost makes having the EBM in store much less feasible, and would result in extremely high operating capital required. This bookstore would look and feel very similar to other bookstores that consumers are used to shopping in, so developing a brand and differentiating from the competition would be very difficult.

This bookstore model is the weakest of the four that we developed and analyzed, with projected revenues between $80,000 and $450,000, and operating losses in the range of $490,000 and $330,000 in the first year, not including startup costs. We did not analyze this model statistically because the model was built to calculate the performance of a bookstore that uses print on demand technology as the main means of book distribution, and this bookstore model would most likely focus on pre-printed books. The final projections for this model are $261,000 in revenue with a $410,000 operating loss.

Minimalist Store

The advantage of the minimalist store over the other models is the complete minimization of overhead: a severe reduction in inventory, less employees, and its small footprint allows for minimal space requirements, which means a reduction in rent and increased flexibility when evaluating location options. In regards to disadvantages, the minimalist model will have to face competition from other bookstores in the area (i.e. Barnes and Noble, or any independent bookstore) that may be able to offer a better customer experience. Unlike the competition, the minimalist store will not feature the same bookstore experience that often features a cafe and a lounging area where customers can enjoy themselves. This model allows for the bare minimum customer experience: browsing the titles on the EBM, and buying and printing a book.

Based on the team's analysis, the minimalist model will have one EBM and three employees at all times. After accounting for all of the above variables in the statistical model, the

minimalist store is projected to see between$88,000 and $368,000 of revenue per year, with profits after operating costs between$-102,100 and $28,744. The final projections are $228,000 in revenue with an operating loss of $37,000.

Table VIII. Proposed Business Models Comparison

Rankings are 1-5, 5 being the best	Airport	Hybrid	Minimalist	Modernist
Customer Requirement				
Convenience	5	3	3	4
Selection	5	5	4	4
Price	3	3	3	3
Service	4	3	4	4
Business Requirement				
Inventory	5	1	5	4
Retail Space	4	1	5	4
#/Quality of Employees	5	2	3	5
Overproduction	4	1	5	5
Browsing Capability	3	5	2	3

As seen in table VIII above, the four business models were ranked on how well they were able to meet both the customer and business requirements. The hybrid model excels in selection while staying mediocre in convenience, price, and service. Additionally, the hybrid model does not meet the business requirements that it was seeking to improve, but it does excel in selection because it is able to hold inventory. The minimalist model, while excelling in the majority of the business requirements, still leaves much room for improvement on the customer requirements side. The modernist model does very well on both the customer requirement and business requirement side, but it the most expensive of the models as the well. The airport model is the most profitable model based on the team's projections, and scores the best for both customer and business requirements.

Launching the Airport Model

To launch the airport bookstore model, a location must first be chosen. For this project, San Francisco International Airport (SFO) was used as an example because of the large amount of travelers that go through every year. Every airport has different regulations and requirements for businesses located inside the airport, so these must be investigated for each location. For SFO, businesses that have a proven track record are preferred, but six-month trials are granted to new

concepts. At the end of this trial, the business will be reviewed and potentially gain the opportunity to go through the competitive selection process and obtain a long-term lease.

At SFO, along with most airports, the rent varies based on the business that is leasing the space, but the average cost per square foot of actual spaces available at the time of the project was used to estimate the rent and deposits for this business. Start-up costs for the business then were estimated can be seen in table IX. The start-up costs assume that two EBMs will be necessary, which will depend on the amount of traffic coming through the store. Based on the statistical testing, two EBMs is the right number of machines to start with because that is where profit is maximized based on a pessimistic market estimation and the business will still be profitable based on an optimistic market estimation. Additionally, more machines can be purchased if the store requires them, whereas it would be much more difficult to return a machine.

Table IX. Airport Model Start-up Cost

Airport Start-up Cost			
Item	Quantity	Price	Total Cost
Bookshelves	4	$200	$800
Chairs	12	$190	$2,280
Tablets	4	$350	$1,400
Counter	1	$400	$400
Tables	4	$150	$600
Fixtures			$0
Paint	1	$750	$750
Carpet	1	$3,000	$3,000
Fees and Permits	1	$301	$301
Starting Inventory	2000	$3	$6,000
EBM Hardware	2	$85,000	$170,000
EBM Software Fees	1	$25,000	$25,000
Website	1	$6,000	$6,000
App	1	$35,000	$35,000
Deposits	1	$6,000	$6,000
Signs	2	$500	$1,000
Business Cards/Bookmarks	10	$20	$200
Miscellaneous			$0
Total			$258,731
Minimum			$213,981

Depending on the number of customers that the store is servicing per day, the operating costs will vary. As the number of customers increase, the number of employees, EBMs, and amount of space required will increase. The projected operating costs for the airport model can be seen below in table X, for both the pessimistic and optimistic estimations.

Table X. Airport Model Operating Cost

Pessimistic		
Airport Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	SFO - 750 sq ft	$4,375.00
Employee Wages	3 @ $12/hr, 12 hr day	$12,960.00
Utilities	$1.36/sq ft/year	$85.00
Office/Cleaning Supplies	?	$150.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$18,153.33
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**2,793**

Optimistic		
Airport Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	SFO - 1250 sq ft	$7,291.67
Employee Wages	4 @ $12/hr, 12 hr day	$17,280.00
Utilities	$1.36/sq ft/year	$141.67
Office/Cleaning Supplies	?	$150.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$25,446.67
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**3,915**

After the store is launched, it will be the responsibility of the management to respond to the needs of the customers and continue to develop the brand. Several of the assumptions made during this project may be incorrect, so it will very important for management to be able to quickly respond to any issues that arise. After validating the first bookstore at SFO, there are many opportunities for expansion. Additional bookstores of the same brand can be opened in separate terminals of SFO, and the business model can be brought to other airports across the country that are large enough to support it. Adoption of the business model should be easier with the other airports because the performance of the first business will prove that consumers will shop at this kind of store in an airport.

SECTION V
CONCLUSION

Summary of Work

For this project, the team aimed to create several bookstore business models that utilized print on demand technology to increase the viability of brick and mortar retail bookstores. The team began by examining the industry (past, present, and future trends) and looking into all of the current channels that consumers are buying books through. The team looked into the patent on the current technology, spoke with experts in intellectual property, and developed four business models for bookstores that could take advantage of trends and barriers to entry going on in the bookstore industry. Several bookstore managers and experts who work in the industry were surveyed and the extensive surveys that have already been done on bookstore consumers were analyzed so that the performance of the business models could be effectively predicted. The cost of starting each business, the operating costs, and market and demographic statistics were researched, and then financial models built to predict each model's performance. Taking these statistics into consideration, a statistical model was crafted that accounts for random demand and more accurate predictions of the performance of each bookstore model, given fluctuating customer demand. This allowed for refining the number of EBMs and employees needed for each model and finalizing a choice for the best bookstore business model that utilizes print on demand technology.

Observations

Based on research and interviews with industry experts, it is vital for the publishers and bookstores to find a way to distribute books to consumers efficiently, without devaluing the worth of their products. An attempt at this was made with e-books, but they have not only cannibalized their print sales, but have made the content of books worth less in consumers' eyes. This has led to the decline in the number of physical bookstores and put the industry in jeopardy as they search for a solution. Print on demand technology, such as the EBM, can greatly increase

the value provided to customers and the financial performance of bookstores, as the well as increasing the health of the publishing industry overall. Based on our financial models and analysis, the airport bookstore model is the most viable and could potentially have the greatest profits. The greatest strengths of that model are the size of the market that it is able to reach, the increased selection for a relatively price-insensitive market, and its ability to offer superior selection than the competition. As print on demand technology becomes more widely adopted, there is no reason why it cannot enter the more traditional retail bookstore and continue to be used in new and innovative ways.

Learning Outcomes

Over the course of this project, a countless number of unexpected bumps and roadblocks had been encountered and learned from. For example, it was learned that intellectual property is necessary in most businesses, but it is possible utilize a superior brand or speed to market as a competitive advantage when starting a business. For a business like the one that this project is proposing, it may easier to utilize existing technology, forgoing intellectual property in the main technology of the business, and leverage strengths in other areas. Also, it is important to minimize risk when starting a business, so all options should be thoroughly investigated and the market should be tested before making a significant investment. By using the principle of *nemawashi,* as used by Toyota, all options are thoroughly considered and then once a decision is made, it is rapidly implemented. Additionally, the team learned how to analyze a business idea for potential profitability using market data and statistical analysis, which is invaluable if they choose to pursue a startup in the future. Extensive research was done on the industry, the businesses within the industry, and its consumers, which taught the process that should be followed to quickly and thoroughly learn about an industry before entering into it. The team also learned how to ask the right questions and reach both consumers and experts working in the industry. As an inexperienced entrepreneur, it is important to use connections and get help from experts in respective areas, as the team did in areas like intellectual property, business development, marketing, and statistical testing. For these reasons, the team has much more confidence in their ability to evaluate business ideas in the future than the team did at the start of this project. A list of the relevant courses that were used over the course of this project is shown below in table IX.

Table XI. Industrial Technology Courses Used

		Senior Project Capstone Experience				
Industrial Tech Courses			Slightly Used	Moderately Used	Heavily Used	
IT	326	Product Evaluation	x			Professional communications with companies
IT	330	Packaging Fundamentals		x		Knowledge on paper materials
IT	402	Developing and Presenting New Enterprise Strategies		x		Developing and presenting company strategies
IT	403	Quality Systems Management		x		Lean principles
IT	407	Applied Business Operations	x			Product development and marketing
IT	408	Paper and Paperboard Packaging	x			Knowledge on paper materials
Support Courses						
Bus	215	Managerial Accounting			x	Financial decision making
Bus	346	Principles of Marketing			x	Marketing strategies
Bus	391	Information Systems			x	Microsoft Excel
GE Courses						
Coms	101	Public Speaking	x			Presentation skills
Eng	145	Reasoning, Argumentation, and Writing	x			Writing

Existing Problems

The problems with starting the airport bookstore that still exist are: lack of relevant titles on EspressNet, the initial investment in the business, the development stage that the technology is currently in, and the pricing structure of books currently being sold from the EBM. OnDemand Books is still having trouble obtaining newer books for the EBM, which could be the difference between thriving and failing for the business. New releases are needed to start this business because, for the average consumer, these are the only books that they are interested in. Also, OnDemand is currently not offering a leasing program for the machine, so it must be purchased outright. Not only does the team not have the capital to invest in the machine to start the business, it is believed that this is an unnecessarily high risk, as one would want to validate the business model in the actual marketplace before making an investment of that size. The team would be able to finance the purchase to make it more feasible, but would prefer being able to rent or lease the machine for OnDemand before making the actual purchase. Additionally, from talking to actual owners of the EBM, the machine still has its bugs and requires a lot of troubleshooting to keep it up and running. To start a business where the EBM was the main means of book distribution, the machine would need to be able to run without jamming or encountering frequent problems. This would necessitate that a developer join the team as the well to improve upon the browsing software that the EBM is currently using. The user interface for the machine would need to be drastically improved to make searching for titles quicker and easier for the consumer, and it would need to be able to connect with other devices, such as the in store tablets or customers' devices through the business' app. Finally, the EBM is currently under the agency pricing model, meaning that publishers control the prices of the books that are

printed off of the EBM. It'd be nice to be able to change the prices of the products as seen fit because that would allow the business to have promotions, sales, frequent buyer discounts, or increase prices in an area where consumers the were insensitive to price. Being able to control the prices would allow the business to serve customers better by giving them better deals, just like a brick and mortar bookstore.

Future Work

The team plans on continuing to work on this project to further validate the feasibility and if it does prove to be promising, plan to start the business. The airport model is the choice direction to continue in, although the team may adopt more of a "Redbox" business model than the current retail model discussed. This would further reduce overhead and it would not detract from the overall customer experience. Customers would still get the novelty of a book printed specifically for them and they would be able to interact with the machine through the user interface on the machine, or on their own device. Also, by not having a retail store, expansion can take place more quickly and gain more market penetration before a competitor is able to copy us.

In order to make this "Redbox" model successful, the team would need to first identify the target market for this model of book distribution and find out where they would use it most. After finding out what type of retail store it would be best to partner with, preliminary conversations with the retailer could begin to figure out the feasibility and what sort of pricing or profit sharing models would be acceptable. The team would then speak with On Demand Books to sell them the concept and structure basic terms that the team would be able to use when selling retailers on putting an EBM in their store. Ideally, the business would begin with one chain, such as a Vons or Staples, and test the concept in several stores. Once the concept is validated and both On Demand and the retailer are happy with the results and terms of the partnership, this business model would be able to be rolled out through all, or most, of their stores. At this point, there would be much more leverage when the team goes to sell to the next retailers.

SECTION VI
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SECTION VII

APPENDIX

Figure I. Gantt Chart

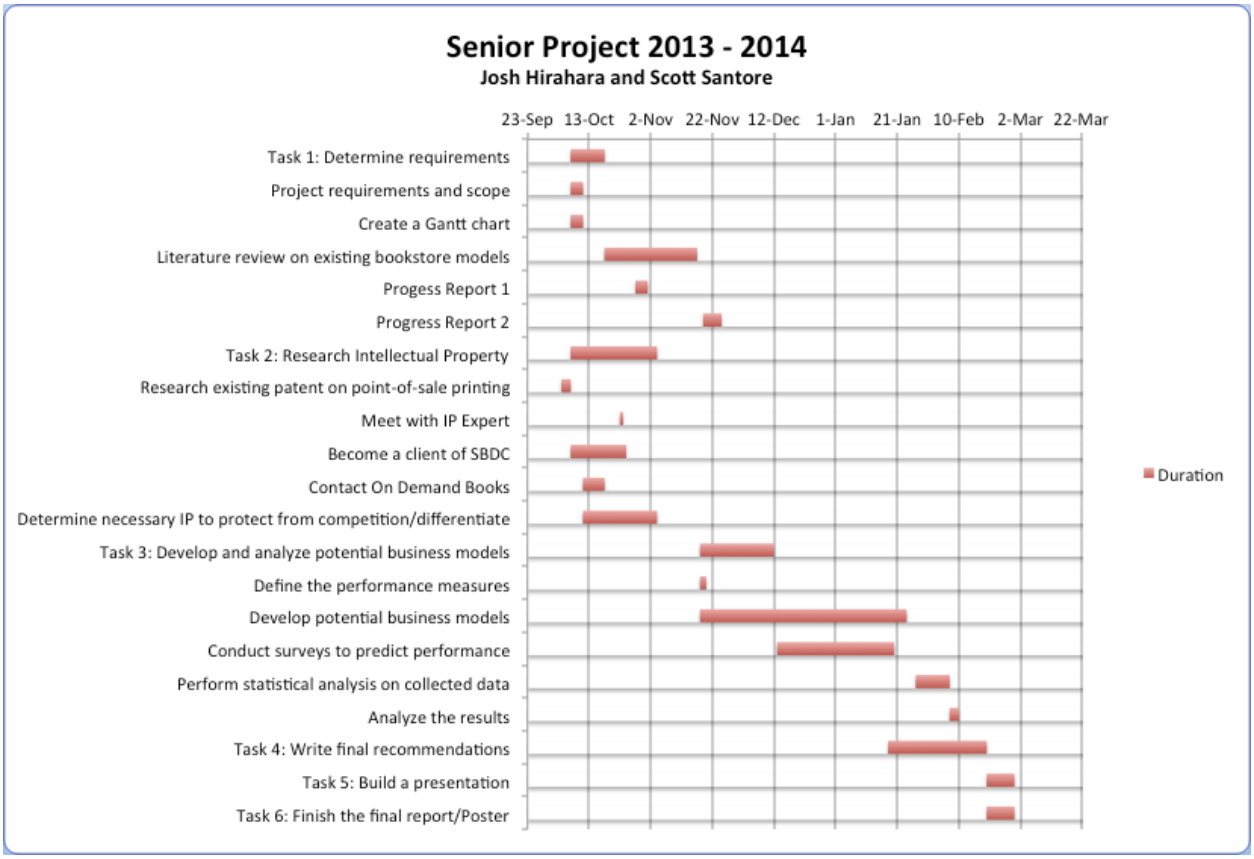


Figure II. E-book and Paperback Consumption

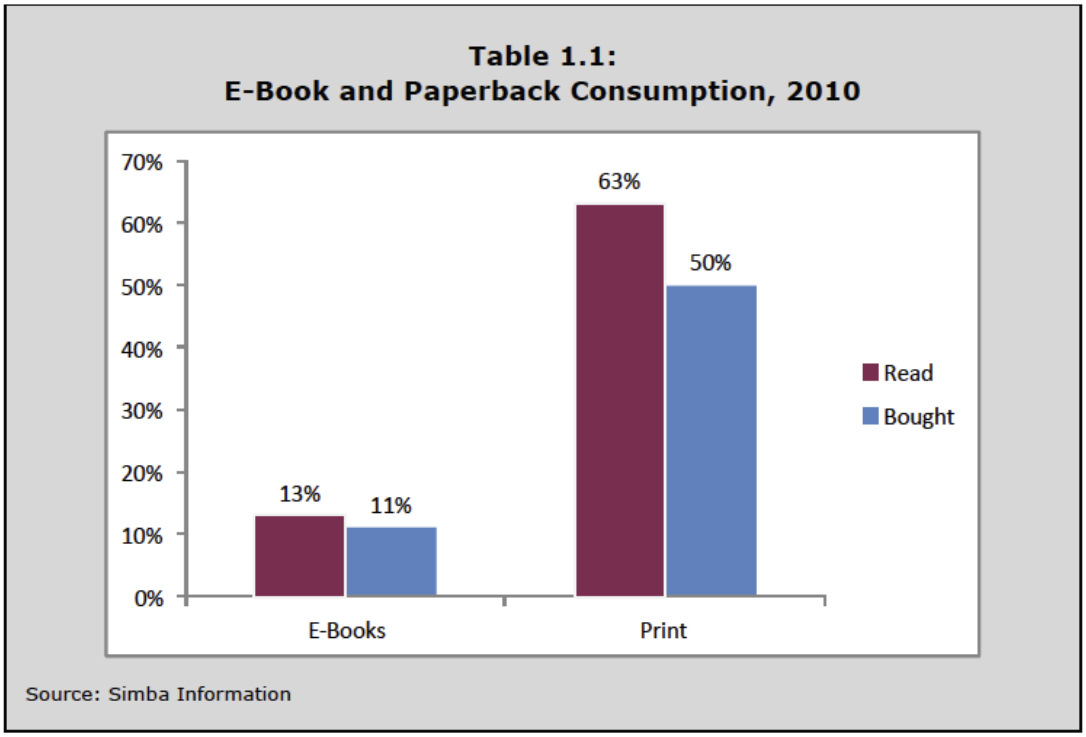


Table I. Overview of Book Purchasing Population by Format

Table 2.2:
Overview of Book Purchasing Population (U.S. Adults): Format Trends

	Winter 2011		Spring 2011		Summer 2011		Fall 2011	
	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers
Audiobook	7,717	6.5%	7,807	6.6%	7,839	6.7%	8,192	7.1%
Hardcover	65,156	54.6%	65,395	55.7%	64,326	55.3%	64,111	55.5%
Paperback	96,234	80.6%	93,412	79.5%	92,428	79.5%	91,198	79.0%
Bought book as gift	60,846	51.0%	60,307	51.3%	59,853	51.5%	59,378	51.4%

Note: Winter figures correspond to 225.6 million adults and to 119.4 million adults who have purchased any book(s) in the 12-month period, while spring and summer figures correspond to 225.7 million adults/117.5 million book buyers and to 225.7 adults/116.2 million adults who have purchased any book(s) in the 12-month period. Fall 2011 corresponds to 226.2 million adults and 115.5 million book purchasers.

Source: Experian Simmons, compiled by Simba Information

Table II. Overview of Book Purchasing Population by Amount Purchased

Table 4.2:
Overview of Book Purchasing Population (U.S. Adults) Customer Trends

	Winter 2011		Spring 2011		Summer 2011		Fall 2011	
Books Purchased	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers	No. of Adults (000)	% of Readers
10 or More Hardcover	5,783	4.8%	5,457	2.4%	5,549	4.8%	5,340	4.6%
6 to 9 Hardcover	9,027	7.6%	8,722	7.4%	8,079	6.9%	7,942	6.9%
1 – 5 Hardcover	44,062	36.9%	44,398	37.8%	44,003	37.9%	43,930	38.0%
10 or more Paperback	16,060	13.5%	16,350	13.9%	15,865	13.6%	15,870	13.7%
6 – 9 Paperback	14,324	12.0%	14,324	12.2%	14,321	12.3%	13,494	11.7%
1 – 5 Paperback	55,435	46.4%	52,154	44.4%	51,755	44.5%	51,461	44.6%

Note: Winter figures correspond to 225.6 million adults and to 119.4 million adults who have purchased any book(s) in the 12-month period, while spring and summer figures correspond to 225.7 million adults/117.5 million book buyers and to 225.7 adults/116.2 million adults who have purchased any book(s) in the 12-month period. Fall 2011 corresponds to 226.2 million adults and 115.5 million book purchasers.

Source: Experian Simmons, compiled by Simba Information

Table III. Fiction Books Price Overview

Table 2.5:
Fiction List Price Overview (Q1-2008 to Q1-2012)

	Q1–2008	Q1–2009	Q1–2010	Q1–2011	Q1-2012
Mass Market					
Number	124	127	180	148	133
Range	$4.75-$7.99	$4.99-$7.99	$4.50-$8.99	$4.75-$8.99	$4.99-8.99
Average	$6.64	$6.49	$6.33	$6.74	$6.64
Median	$7.99	$7.99	$7.99	$7.99	$7.99
Tall Rack					
Number	24	24	28	35	29
Range	$9.99	$9.99	$9.99	$9.99	$9.99
Median	$9.99	$9.99	$9.99	$9.99	$9.99
Tall Rack					
Trade Paper $10 - $30					
Number	76	69	72	83	91
Range	$12.00-$25.00	$10.99-$24.95	$12.95-$16.99	$11.99-$19.99	$10.99-$25.00
Average	$16.19	$16.04	$14.71	$15.21	$16.10
Median	$14.00	$14.95	$14.95	$14.99	$14.99
Trade Cloth $13 - $50					
Number	120	114	125	130	124
Range	$17.95-$35.00	$16.99-$30.00	$16.99-$35.00	$16.95-$36.00	$14.95-$35.00
Average	$25.26	$25.31	$26.75	$25.85	$25.87
Median	25.00	$25.95	$25.99	$25.99	$26.95

Source: Simba Information, Stuart Johnson & Associates

Table IV. Nonfiction Books Price Overview

Table 2.6:
Nonfiction List Price Overview (Q1-2008 to Q1-2012)

	Q1–2008	Q1–2009	Q1–2010	Q1–2011	Q1-2012
Mass Market					
Number	8	4	3	2	3
Range	$6.50-$7.99	$7.99	$7.99	$7.99	$7.50-$7.99
Average	$7.25	$7.99	$7.99	$7.99	$7.75
Median	$7.99	$7.99	$7.99	$7.99	$7.99
Trade Paper $10 -$30					
Number	92	90	115	109	108
Range	$11.00-$21.95	$11.95-$24.95	$11.00-$26.99	$11.00-$26.95	$10.95-
Average	$15.50	$15.79	$17.48	$17.48	$15.93
Median	$14.95	$14.99	$15.99	$15.95	$15.95
Trade Cloth $10 - $40					
Number	158	136	144	164	182
Range	$14.95-$35.00	$14.95-$40.00	$16.99-$40.00	$15.99-$40.00	$14.95-
Average	$24.77	$26.10	$26.06	$26.68	$27.57
Median	$25.00	$25.95	$26.00	$26.00	$26.00

Source: Simba Information, Stuart Johnson & Associates

BOOKSTORE LAYOUT SKETCHES

Figure III. Airport Layout

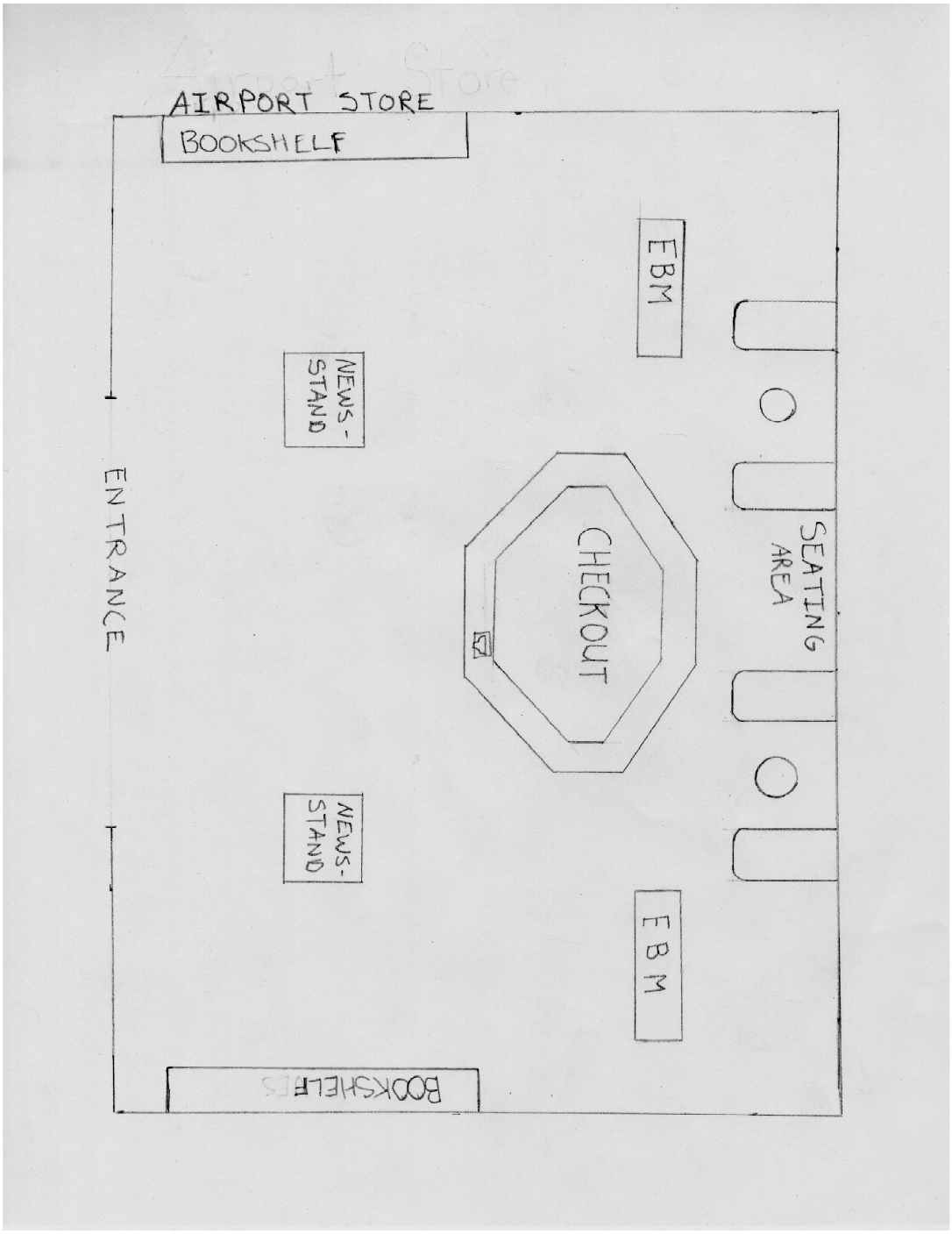


Figure IV. Modernistic Layout

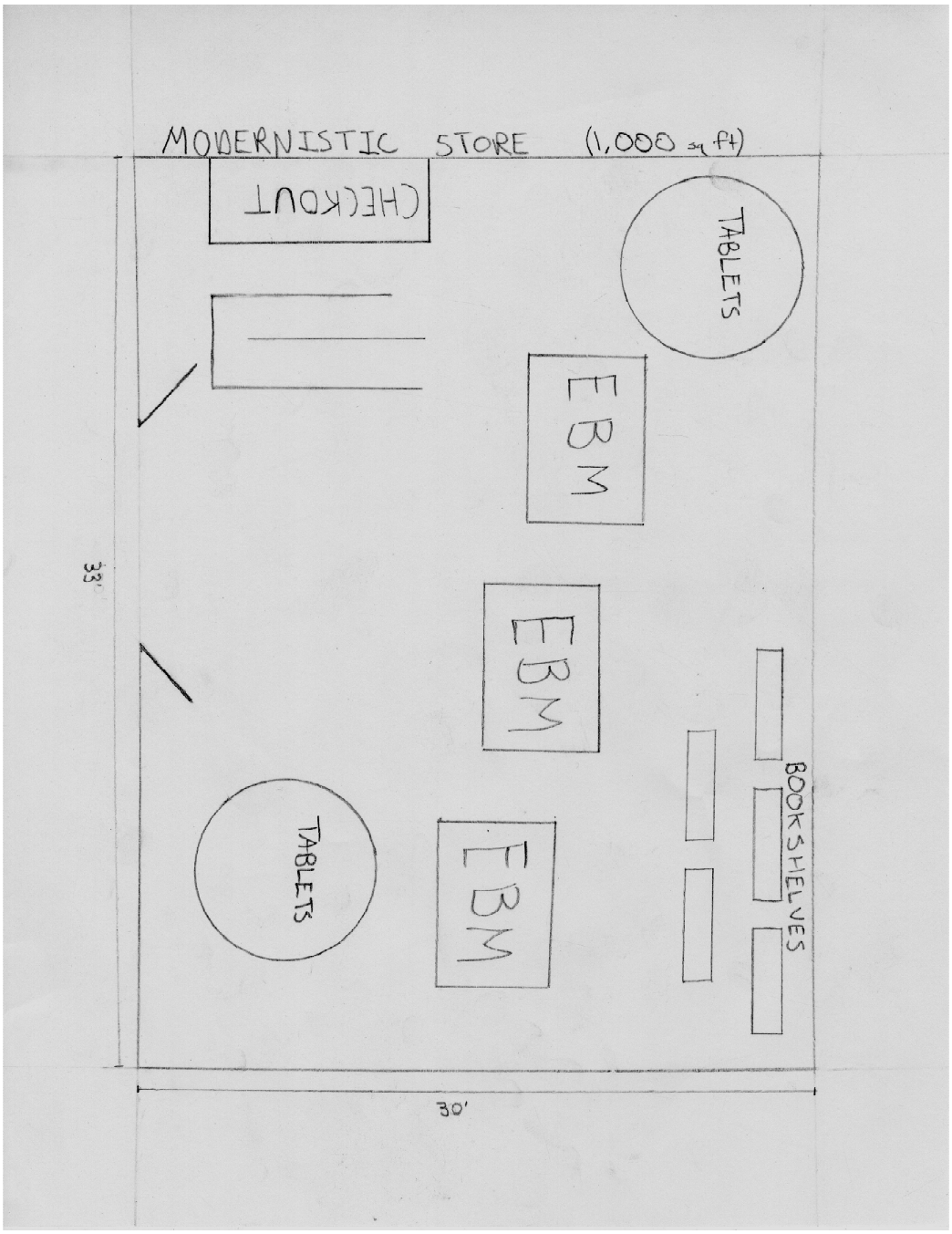


Figure V. Hybrid Layout

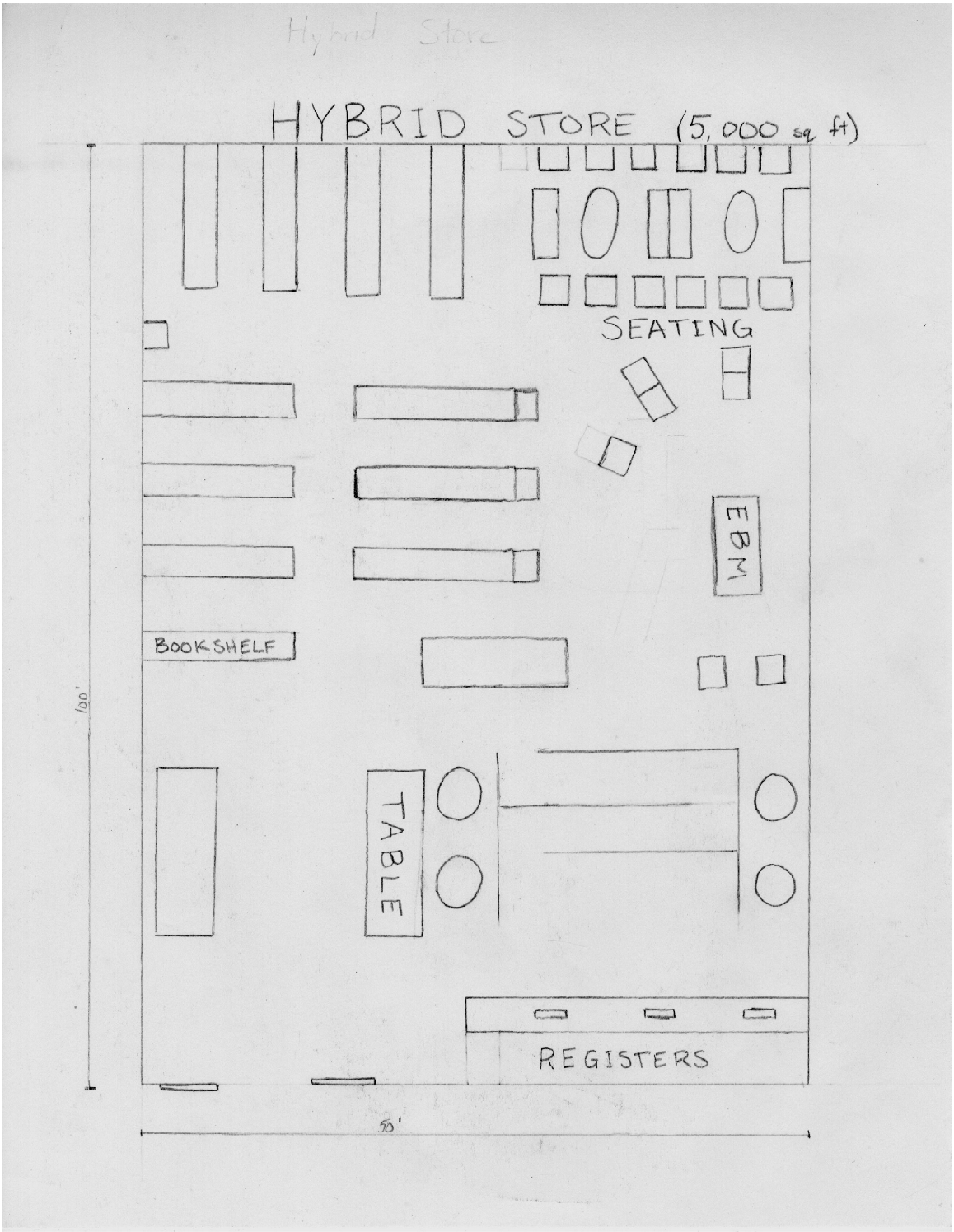
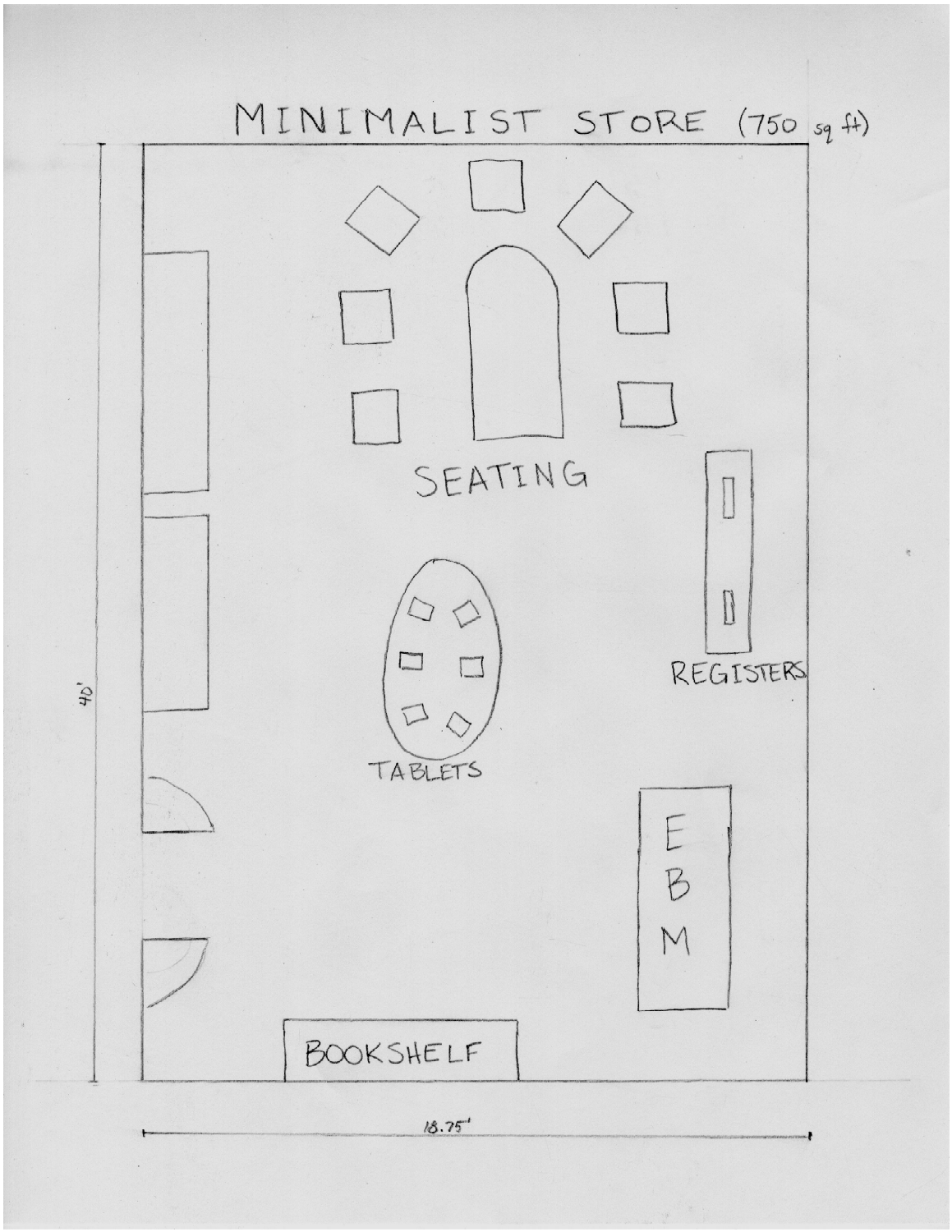


Figure VI. Minimalist Layout



START-UP COST TABLES

Table V. Modernistic Start-up Cost

Modernistic Start-up Cost			
Item	Quantity	Price	Total Cost
Bookshelves	4	$200	$800
Chairs	8	$190	$1,520
Tablets	7	$350	$2,450
Counter	1	$400	$400
Tables	4	$150	$600
Fixtures			$0
Paint	2	$750	$1,500
Carpet	1	$3,000	$3,000
Fees and Permits	1	$700	$700
Starting Inventory	4000	$3	$12,000
EBM Hardware	1	$85,000	$85,000
EBM Software Fees	1	$25,000	$25,000
Website	1	$6,000	$6,000
App	1	$35,000	$35,000
Deposits	1	$2,000	$2,000
Signs	2	$500	$1,000
Business Cards/Bookmarks	15	$20	$300
Miscellaneous			$0
Total			$177,270
Minimum			$131,770

Table VI. Hybrid Start-up Cost

Hybrid Start-up Cost			
Item	Quantity	Price	Total Cost
Bookshelves	15	$200	$3,000
Chairs	8	$190	$1,520
Tablets	5	$350	$1,750
Counter	1	$400	$400
Tables	4	$150	$600
Fixtures			$0
Paint	2	$750	$1,500
Carpet	2	$3,000	$6,000
Fees and Permits	1	$700	$700
Starting Inventory	6000	$3	$18,000
EBM Hardware	1	$85,000	$85,000
EBM Software Fees	1	$25,000	$25,000
Website	1	$6,000	$6,000
App	1	$35,000	$35,000
Deposits	1	$2,000	$2,000
Signs	2	$500	$1,000
Business Cards/Bookmarks	15	$20	$300
Miscellaneous			$0
Total			$187,770
Minimum			$139,270

Table VII. Minimalist Start-up Cost

Minimalist Start-up Cost			
Item	Quantity	Price	Total Cost
Bookshelves	2	$200	$400
Chairs	2	$190	$380
Tablets	4	$350	$1,400
Counter	1	$400	$400
Tables	2	$150	$300
Fixtures			$0
Paint		$750	$0
Carpet		$3,000	$0
Fees and Permits	1	$700	$700
Starting Inventory	2000	$3	$6,000
EBM Hardware	1	$85,000	$85,000
EBM Software Fees	1	$25,000	$25,000
Website	1	$6,000	$6,000
App	1	$35,000	$35,000
Deposits	1	$2,000	$2,000
Signs	2	$500	$1,000
Business Cards/Bookmarks	10	$20	$200
Miscellaneous			$0
Total			$163,780
Minimum			$122,780

Table VIII. Traditional Start-up Cost

Traditional Start-up Cost			
Item	Quantity	Price	Total Cost
Bookshelves	24	$200	$4,800
Chairs	8	$190	$1,520
Tablets	0	$350	$0
Counter	1	$400	$400
Tables	4	$150	$600
Fixtures			$0
Paint	2	$750	$1,500
Carpet	2	$3,000	$6,000
Fees and Permits	1	$700	$700
Starting Inventory	10000	$2	$20,000
EBM Hardware	0	$85,000	$0
Inventory Control Sy	1	$7,500	$7,500
Website	1	$6,000	$6,000
App	0	$35,000	$0
Deposits	1	$2,000	$2,000
Signs	2	$500	$1,000
Business Cards/Bookmarks	15	$20	$300
Miscellaneous			$0
Total			$52,320

OPERATING COST TABLES

Table IX. Modernistic Operating Cost

Pessimistic		
Modernistic Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$5,000.00
Employee Wages	3 @ $12/hr, 12 hr day	$12,960.00
Utilities	$1.36/sq ft/year	$170.00
Office/Cleaning Supplies	?	$150.00
Insurance		$83.33
Website/App Maintenance		$1,000.00
Total		$19,363.33
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**2,979**

Optimistic		
Modernistic Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$5,000.00
Employee Wages	3 @ $12/hr, 12 hr day	$12,960.00
Utilities	$1.36/sq ft/year	$170.00
Office/Cleaning Supplies	?	$150.00
Insurance		$83.33
Website/App Maintenance		$1,000.00
Total		$19,363.33
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**2,979**

Table X. Hybrid Operating Cost

Pessimistic		
Hybrid Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$16,666.67
Employee Wages	6 @ $12/hr, 12 hr day	$25,920.00
Utilities	$1.36/sq ft/year	$566.67
Office/Cleaning Supplies	?	$200.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$43,936.67
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**6,759**

Optimistic		
Hybrid Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$16,666.67
Employee Wages	6 @ $12/hr, 12 hr day	$25,920.00
Utilities	$1.36/sq ft/year	$566.67
Office/Cleaning Supplies	?	$200.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$43,936.67
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**6,759**

Table XI. Minimalist Operating Cost

Pessimistic		
Minimalist Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$2,500.00
Employee Wages	2 @ $12/hr, 12 hr day	$8,640.00
Utilities	$1.36/sq ft/year	$85.00
Office/Cleaning Supplies	?	$120.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$11,928.33
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**1,835**

Optimistic		
Minimalist Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$2,500.00
Employee Wages	2 @ $12/hr, 12 hr day	$8,640.00
Utilities	$1.36/sq ft/year	$85.00
Office/Cleaning Supplies	?	$120.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$11,928.33
Variable Cost		
Materials	200 page book	$3.00
Content Fee	30%	$4.50
On Demand Fee		$1.00
Total		$8.50
Breakeven	**$15/book**	**1,835**

Table XII. Traditional Operating Cost

Pessimistic		
Taditional Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$16,666.67
Employee Wages	6 @ $12/hr, 12 hr day	$25,920.00
Utilities	$1.36/sq ft/year	$566.67
Office/Cleaning Supplies	?	$200.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$43,936.66
Variable Cost	60%	
Breakeven	**$15/book**	**7,323**

Optimistic		
Traditional Operating Cost		
Fixed Cost		
Item	Details	Cost/Month
Rent	La Jolla, San Diego	$16,666.67
Employee Wages	6 @ $12/hr, 12 hr day	$25,920.00
Utilities	$1.36/sq ft/year	$566.67
Office/Cleaning Supplies	?	$200.00
Insurance		$83.33
Website/App Maintenance		$500.00
Total		$43,936.66
Variable Cost	60%	
Breakeven	**$15/book**	**7,323**

REVENUE FORECASTS

Figure VII. Airport Revenue Forecast Based on Market Data

Initial Revenue Forecast - Airport											
Location: SFO					Bay Area						
Pessimistic											
Retail					Online						
Population Variables	Number	Percentage			Population Variables	Number	Percentage			**Totals**	Number	Percentage
Market Population	44,500,000	100.0%			Market Population	7,150,000	100.0%			Retail Customers	38,938	0.1%
Target Market Population	22,250,000	50.0%			Target Market Population	22,250,000	311.2%			Online Customers	0	0.0%
Bookstore Shoppers	7,787,500	35.0%			Online Shoppers	3,337,500	15.0%			Total Customers	38,938	0.08%
										Total Books Sold	42,345	
										Retail Revenue	$635,168	
Revenue Variables	Number	Percentage	Revenue		Revenue Variables	Number	Percentage	Revenue		Online Revenue	$0	
Average Book Price	$15				Average Book Price	$15				Total Revenue	**$635,168**	
Try Product	38,938	0.5%	$584,063		Try Product	0	0.0%	$0		Gross Profit	$275,239.45	
Return Customers	1,947	5.0%	$51,105		Return Customers	0	0.0%	$0		Operating Profit	$57,399.45	
# of Books Purchased					# of Books Purchased					Net Income		
1	973	50.0%	$14,602		1	0	50.0%	$0				
2	487	25.0%	$14,602		2	0	25.0%	$0				
3	487	25.0%	$21,902		3	0	25.0%	$0				
Total Customers	**38,938**	**0.1%**	**$635,168**		**Total Customers**	**0**	**0.0%**	**$0**				
Optimistic											
Retail					Online						
Population Variables	Number	Percentage			Population Variables	Number	Percentage			**Totals**	Number	Percentage
Market Population	44,500,000	100.0%			Market Population	7,150,000	100.0%			Retail Customers	155,750	0.4%
Target Market Population	22,250,000	50.0%			Target Market Population	22,250,000	311.2%			Online Customers	0	0.0%
Bookstore Shoppers	7,787,500	35.0%			Online Shoppers	3,337,500	15.0%			Total Customers	155,750	0.30%
										Total Books Sold	169,378	
										Retail Revenue	$2,540,672	
Revenue Variables	Number	Percentage	Revenue		Revenue Variables	Number	Percentage	Revenue		Online Revenue	$0	
Average Book Price	$15				Average Book Price	$15				Total Revenue	**$2,540,672**	
Try Product	155,750	2.0%	$2,336,250		Try Product	0	0.0%	$0		Gross Profit	$1,100,957.81	
Return Customers	7,788	5.0%	$204,422		Return Customers	0	0.0%	$0		Operating Profit	$795,597.81	
# of Books Purchased					# of Books Purchased					Net Income		
1	3,894	50.0%	$58,406		1	0	50.0%	$0				
2	1,947	25.0%	$58,406		2	0	25.0%	$0				
3	1,947	25.0%	$87,609		3	0	25.0%	$0				
Total Customers	**155,750**	**0.4%**	**$2,540,672**		**Total Customers**	**0**	**0.0%**	**$0**				

Figure VIII. Modernistic Revenue Forecast Based on Market Data

Initial Revenue Forecast - Modernistic
Location: La Jolla, San Diego — **San Diego County**

Pessimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	520	10.0%	$7,806
Return Customers	130	25.0%	$12,684
# of Books Purchased			
2	65	50.0%	$1,951
7	33	25.0%	$3,415
15	33	25.0%	$7,318
Total Customers	**520**	**1.2%**	**$20,490**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	3,000	2.0%	$45,000
Return Customers	150	5.0%	$3,938
# of Books Purchased			
1	75	50.0%	$1,125
2	38	25.0%	$1,125
3	38	25.0%	$1,688
Total Customers	**3,000**	**0.1%**	**$48,938**

Totals	Number	Percentage
Retail Customers	520	1.2%
Online Customers	3,000	0.1%
Total Customers	3,520	0.11%
Total Books Sold	4,628	
Retail Revenue	$20,490	
Online Revenue	$48,938	
Total Revenue	**$69,427**	
Gross Profit	$30,085.23	
Operating Profit	-$202,274.73	
Net Income		

Optimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	2,082	40.0%	$31,223
Return Customers	729	35.0%	$92,888
# of Books Purchased			
3	364	50.0%	$16,392
8	182	25.0%	$21,856
20	182	25.0%	$54,640
Total Customers	**2,082**	**4.9%**	**$124,111**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	7,500	5.0%	$112,500
Return Customers	2,625	35.0%	$334,688
# of Books Purchased			
3	1,313	50.0%	$59,063
8	656	25.0%	$78,750
20	656	25.0%	$196,875
Total Customers	**7,500**	**0.2%**	**$447,188**

Totals	Number	Percentage
Retail Customers	2,082	4.9%
Online Customers	7,500	0.2%
Total Customers	9,582	0.30%
Total Books Sold	38,087	
Retail Revenue	$124,111	
Online Revenue	$447,188	
Total Revenue	**$571,298**	
Gross Profit	$247,562.52	
Operating Profit	$15,202.56	
Net Income		

Figure IX. Hybrid Revenue Forecast Based on Market Data

Initial Revenue Forecast - Hybrid
Location: La Jolla, San Diego — **San Diego County**

Pessimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	520	10.0%	$7,806
Return Customers	130	25.0%	$12,684
# of Books Purchased			
2	65	50.0%	$1,951
7	33	25.0%	$3,415
15	33	25.0%	$7,318
Total Customers	**520**	**1.2%**	**$20,490**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	3,000	2.0%	$45,000
Return Customers	150	5.0%	$14,625
# of Books Purchased			
2	75	50.0%	$2,250
7	38	25.0%	$3,938
15	38	25.0%	$8,438
Total Customers	**3,000**	**0.1%**	**$59,625**

Totals	Number	Percentage
Retail Customers	520	1.2%
Online Customers	3,000	0.1%
Total Customers	3,520	0.11%
Total Books Sold	5,341	
Retail Revenue	$20,490	
Online Revenue	$59,625	
Total Revenue	**$80,115**	
Gross Profit	$34,716.48	
Operating Profit	-$492,523.52	
Net Income		

Optimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	2,082	40.0%	$31,223
Return Customers	520	25.0%	$66,348
# of Books Purchased			
3	260	50.0%	$11,709
8	130	25.0%	$15,611
20	130	25.0%	$39,029
Total Customers	**2,082**	**4.9%**	**$97,571**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	7,500	5.0%	$112,500
Return Customers	1,875	25.0%	$239,063
# of Books Purchased			
3	938	50.0%	$42,188
8	469	25.0%	$56,250
20	469	25.0%	$140,625
Total Customers	**7,500**	**0.2%**	**$351,563**

Totals	Number	Percentage
Retail Customers	2,082	4.9%
Online Customers	7,500	0.2%
Total Customers	9,582	0.30%
Total Books Sold	29,942	
Retail Revenue	$97,571	
Online Revenue	$351,563	
Total Revenue	**$449,134**	
Gross Profit	$194,624.63	
Operating Profit	-$332,615.38	
Net Income		

Figure X. Minimalist Revenue Forecast Based on Market Data

Initial Revenue Forecast - Minimalist
Location: La Jolla, San Diego — **San Diego County**

Pessimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	520	10.0%	$7,806
Return Customers	130	25.0%	$12,684
# of Books Purchased			
2	65	50.0%	$1,951
7	33	25.0%	$3,415
15	33	25.0%	$7,318
Total Customers	**520**	**1.2%**	**$20,490**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	3,000	2.0%	$45,000
Return Customers	150	5.0%	$14,625
# of Books Purchased			
2	75	50.0%	$2,250
7	38	25.0%	$3,938
15	38	25.0%	$8,438
Total Customers	**3,000**	**0.1%**	**$59,625**

Totals	Number	Percentage
Retail Customers	520	1.2%
Online Customers	3,000	0.1%
Total Customers	3,520	0.11%
Total Books Sold	5,341	
Retail Revenue	$20,490	
Online Revenue	$59,625	
Total Revenue	**$80,115**	
Gross Profit	$34,716.48	
Operating Profit	-$108,423.48	
Net Income		

Optimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	2,082	40.0%	$31,223
Return Customers	520	25.0%	$66,348
# of Books Purchased			
3	260	50.0%	$11,709
8	130	25.0%	$15,611
20	130	25.0%	$39,029
Total Customers	**2,082**	**4.9%**	**$97,571**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	7,500	5.0%	$112,500
Return Customers	1,875	25.0%	$239,063
# of Books Purchased			
3	938	50.0%	$42,188
8	469	25.0%	$56,250
20	469	25.0%	$140,625
Total Customers	**7,500**	**0.2%**	**$351,563**

Totals	Number	Percentage
Retail Customers	2,082	4.9%
Online Customers	7,500	0.2%
Total Customers	9,582	0.30%
Total Books Sold	29,942	
Retail Revenue	$97,571	
Online Revenue	$351,563	
Total Revenue	**$449,134**	
Gross Profit	$194,624.63	
Operating Profit	$51,484.67	
Net Income		

Figure XI. Traditional Revenue Forecast Based on Market Data

Initial Revenue Forecast - Traditional
Location: La Jolla, San Diego — **San Diego County** — Focuses on more than just millennials

Pessimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	520	10.0%	$7,806
Return Customers	130	25.0%	$12,684
# of Books Purchased			
2	65	50.0%	$1,951
7	33	25.0%	$3,415
15	33	25.0%	$7,318
Total Customers	**520**	**1.2%**	**$20,490**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	3,000	2.0%	$45,000
Return Customers	150	5.0%	$14,625
# of Books Purchased			
2	75	50.0%	$2,250
7	38	25.0%	$3,938
15	38	25.0%	$8,438
Total Customers	**3,000**	**0.1%**	**$59,625**

Totals	Number	Percentage
Retail Customers	520	1.2%
Online Customers	3,000	0.1%
Total Customers	3,520	0.11%
Total Books Sold	5,341	
Retail Revenue	$20,490	
Online Revenue	$59,625	
Total Revenue	**$80,115**	
Gross Profit	$34,716.48	
Operating Profit	-$492,523.48	
Net Income		

Optimistic

Retail			
Population Variables	Number	Percentage	
Market Population	42,826	100.0%	
Target Market Population	14,868	34.7%	
Bookstore Shoppers	5,204	35.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	2,082	40.0%	$31,223
Return Customers	520	25.0%	$66,348
# of Books Purchased			
3	260	50.0%	$11,709
8	130	25.0%	$15,611
20	130	25.0%	$39,029
Total Customers	**2,082**	**4.9%**	**$97,571**

Online			
Population Variables	Number	Percentage	
Market Population	3,177,000	100.0%	
Target Market Population	1,000,000	31.5%	
Online Shoppers	150,000	15.0%	
Revenue Variables	Number	Percentage	Revenue
Average Book Price	$15		
Try Product	7,500	5.0%	$112,500
Return Customers	1,875	25.0%	$239,063
# of Books Purchased			
3	938	50.0%	$42,188
8	469	25.0%	$56,250
20	469	25.0%	$140,625
Total Customers	**7,500**	**0.2%**	**$351,563**

Totals	Number	Percentage
Retail Customers	2,082	1.2%
Online Customers	7,500	0.1%
Total Customers	9,582	0.11%
Total Books Sold	29,942	
Retail Revenue	$97,571	
Online Revenue	$351,563	
Total Revenue	**$449,134**	
Gross Profit	$194,624.63	
Operating Profit	-$332,615.34	
Net Income		

MONTE CARLO SIMULATIONS

Figure XII. Monte Carlo Simulation – Airport Pessimistic Two

Airport - Pessimistic 2								
Parameters								
10	Arrival Rate (customers per hour)			40k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
2	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	1			1	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	10	0.45454545				
	Service	-1	12	0.54545455				
	Loss	-1	0	0				
			Sum of rates					
			22					
0.04545455	E (Waiting time until next transition)							
0.04643544	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	2						
			Average costs/hr in simulation					
		Total time si	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		53.8695865	0.28563128	38.8718403	2.46892558	41.6263971	62.5028002	20.876403
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	1	0.04643544	0	1.43949852	0	0		
1	1	0.0508149	0	1.57526205	0	7		
2	0	0.15310731	0	9.49265341	0	0		
3	1	0.06552978	0	2.03142314	0	7		
4	0	0.34827443	0	21.5930147	0	0		
5	1	0.00578221	0	0.17924852	0	7		
6	0	0.09765631	0	6.05469128	0	0		
7	1	0.02110884	0	0.65437417	0	0		
8	2	0.02451933	0	0	0	7		
9	1	0.02334149	0	0.72358608	0	7		
10	0	0.04001753	0	2.48108676	0	0		
11	1	0.02012712	0	0.62394058	0	7		
12	0	0.08233111	0	5.10452873	0	0		
13	1	0.08959849	0	2.77755327	0	0		
14	2	0.03495018	0	0	0	0		
15	3	0.02213049	0.11065246	0	0	7		
16	2	0.05251454	0	0	0	7		
17	1	0.0463907	0	1.43811164	0	7		

Figure XIII. Monte Carlo Simulation – Airport Pessimistic Three

Airport - Pessimistic 3								
Parameters								
10	Arrival Rate (customers per hour)			40k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
3	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	1			1	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	10	0.45454545				
	Service	-1	12	0.54545455				
	Loss	-1	0	0				
			Sum of rates					
			22					
0.04545455	E (Waiting time until next transition)							
0.01987973	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	0						
			Average costs/hr in simulation					
		Total time si	Queue	Idle	Lost	Total Cost/h	Total Gross F	Difference
		51.6633495	0.07859902	68.2745734	0.54197028	68.8951427	67.2043148	-1.6908279
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	1	0.01987973	0	1.23254333	0	0		
1	1	0.02031143	0	1.25930872	0	0		
2	2	0.01529652	0	0.47419215	0	7		
3	1	0.00285693	0	0.17712945	0	7		
4	0	0.0483812	0	4.49945139	0	0		
5	1	0.00124443	0	0.0771545	0	0		
6	2	0.05175326	0	1.60435094	0	7		
7	1	0.05295216	0	3.28303372	0	0		
8	2	0.21411221	0	6.63747845	0	7		
9	1	0.02517263	0	1.56070309	0	0		
10	2	0.04753243	0	1.47350542	0	7		
11	1	0.00415946	0	0.25788678	0	7		
12	0	0.0442749	0	4.11756562	0	0		
13	1	0.01340052	0	0.83083229	0	7		
14	0	0.0387783	0	3.60638181	0	0		
15	1	0.00319684	0	0.19820399	0	0		
16	2	0.00752439	0	0.2332562	0	0		
17	3	0.0038236	0	0	0	7		

Figure XIV. Monte Carlo Simulation – Airport Optimistic One

Airport - Optimistic 1								
Parameters								
35	Arrival Rate (customers per hour)			150k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
1	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	7			1	6		
	Transitions	# change	Rate	Probability				
	Arrival	1	35	0.49295775				
	Service	-1	12	0.16901408				
	Loss	-1	24	0.33802817				
			Sum of rates					
			71					
0.01408451	E (Waiting time until next transition)							
0.018668	Simulated waiting time until next transition (Duration)							
Loss	Next transition							
		# of Customers in System						
	Update	6						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		15.5865379	25.2234165	0.08456853	140.120918	165.428903	84.4318351	-80.997068
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	7	0.018668	0.56003986	0	7	0		
1	5	0.01794685	0.35893707	0	0	7		
2	4	0.00416696	0.06250445	0	7	0		
3	3	0.03104511	0.31045106	0	0	0		
4	4	0.01319688	0.19795314	0	0	7		
5	3	0.01401473	0.14014732	0	0	0		
6	4	0.00062551	0.00938259	0	0	7		
7	3	0.06233662	0.62336617	0	0	0		
8	4	0.00991242	0.14868634	0	0	0		
9	5	0.001429	0.02857993	0	0	0		
10	6	0.01355215	0.33880382	0	0	0		
11	7	0.00285473	0.08564185	0	7	0		
12	6	0.02316045	0.57901133	0	7	0		
13	5	0.00372201	0.0744403	0	7	0		
14	4	0.01616016	0.24240233	0	0	0		
15	5	0.00748176	0.14963518	0	0	0		
16	6	0.01671266	0.41781649	0	0	0		
17	7	0.00410698	0.12320938	0	7	0		

Figure XV. Monte Carlo Simulation – Airport Optimistic Two

Airport - Optimistic 2								
Parameters								
35	Arrival Rate (customers per hour)			150k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
2	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	3			2	1		
	Transitions	# change	Rate	Probability				
	Arrival	1	35	0.55555556				
	Service	-1	24	0.38095238				
	Loss	-1	4	0.06349206				
			Sum of rates					
			63					
0.01587302	E (Waiting time until next transition)							
0.0007387	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	2						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		14.1035142	18.617795	1.15093252	106.214662	125.98339	143.935757	17.9523675
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	3	0.0007387	0.00369352	0	0	0		
1	9	0.04387293	1.53555264	0	0	0		
2	10	0.01148905	0.45956181	0	7	0		
3	9	0.00592854	0.20749884	0	0	0		
4	10	0.00175928	0.0703712	0	0	0		
5	11	0.00613603	0.2761214	0	0	0		
6	12	0.05241879	2.62093957	0	7	0		
7	11	0.00669484	0.30126786	0	0	0		
8	12	0.00792371	0.39618562	0	7	0		
9	11	0.01109192	0.49913627	0	0	0		
10	12	0.0019168	0.0958398	0	0	0		
11	13	0.014502	0.79760977	0	0	7		
12	12	0.02985552	1.4927758	0	7	0		
13	11	0.00511461	0.23015723	0	0	0		
14	12	0.01342798	0.67139917	0	7	0		
15	11	0.00502094	0.22594209	0	7	0		
16	10	0.00540007	0.21600292	0	0	0		
17	11	0.00278289	0.12522999	0	7	0		

Figure XVI. Monte Carlo Simulation – Airport Optimistic Three

Airport - Optimistic 3								
Parameters								
35	Arrival Rate (customers per hour)			150k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
3	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	3			3	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	35	0.49295775				
	Service	-1	36	0.50704225				
	Loss	-1	0	0				
			Sum of rates					
			71					
0.01408451	E (Waiting time until next transition)							
0.00680673	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	4						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		14.2832195	5.2248997	20.8212938	29.4051351	55.4513286	215.147572	159.696243
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	3	0.00680673	0	0	0	7		
1	1	0.01042208	0	0.64616892	0	0		
2	2	0.01013099	0	0.31406054	0	0		
3	3	0.01425906	0	0	0	7		
4	2	0.01024086	0	0.31746653	0	7		
5	1	0.03737646	0	2.3173405	0	0		
6	2	0.00366975	0	0.11376235	0	0		
7	3	0.05179791	0	0	0	7		
8	2	0.01717897	0	0.53254817	0	7		
9	1	0.06968843	0	4.32068236	0	0		
10	2	0.03898143	0	1.20842424	0	7		
11	1	0.00109798	0	0.06807453	0	0		
12	2	0.0705064	0	2.18569843	0	0		
13	3	0.01854363	0	0	0	0		
14	4	0.00717415	0.03587076	0	0	0		
15	5	0.01032624	0.10326236	0	0	0		
16	6	0.00710013	0.10650198	0	0	7		
17	5	0.00364338	0.03643376	0	0	0		

Figure XVII. Monte Carlo Simulation – Airport Optimistic Four

Airport - Optimistic 4								
Parameters								
35	Arrival Rate (customers per hour)			150k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
4	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	5			4	1		
	Transitions	# change	Rate	Probability				
	Arrival	1	35	0.40229885				
	Service	-1	48	0.55172414				
	Loss	-1	4	0.04597701				
			Sum of rates					
			87					
0.01149425	E (Waiting time until next transition)							
0.00537784	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	4						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		14.5977643	3.52465143	37.8919198	16.7833919	58.1999631	222.97935	164.779387
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	5	0.00537784	0.02688919	0	0	7		
1	3	0.01285153	0	0.39839757	0	0		
2	4	0.01269088	0	0	0	7		
3	3	0.00551267	0	0.17089288	0	0		
4	4	0.0046642	0	0	0	7		
5	3	0.00410569	0	0.12727647	0	7		
6	2	0.04055519	0	2.51442209	0	7		
7	1	0.01377667	0	1.28123071	0	0		
8	2	0.01104196	0	0.6846018	0	0		
9	3	0.03400863	0	1.05426764	0	0		
10	4	0.00253228	0	0	0	0		
11	5	0.00189666	0.00948332	0	0	0		
12	6	0.00254998	0.02549984	0	0	0		
13	7	0.00832319	0.12484788	0	0	7		
14	6	0.00866632	0.08666315	0	0	7		
15	5	0.00480978	0.02404889	0	0	0		
16	6	0.00523885	0.05238845	0	0	0		
17	7	0.04495454	0.67431812	0	0	7		

Figure XVIII. Monte Carlo Simulation – Airport Optimistic Five

Airport - Optimistic 5								
Parameters								
35	Arrival Rate (customers per hour)			150k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
5	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	3			3	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	35	0.49295775				
	Service	-1	36	0.50704225				
	Loss	-1	0	0				
			Sum of rates					
			71					
0.01408451	E (Waiting time until next transition)							
0.01664384	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	2						
			Average costs/hr in simulation					
		Total time si	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		13.5673118	1.89882648	56.9479045	8.77108168	67.6178126	250.233801	182.615988
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	3	0.01664384	0	1.03191785	0	0		
1	7	0.0050117	0.05011701	0	0	7		
2	6	0.00269881	0.01349404	0	0	0		
3	7	0.00540263	0.05402634	0	0	0		
4	8	0.00058896	0.00883437	0	0	7		
5	7	0.00142149	0.01421489	0	0	7		
6	6	0.01244532	0.06222658	0	0	7		
7	5	0.00638759	0	0	0	7		
8	4	0.00906301	0	0.28095332	0	7		
9	3	0.01011614	0	0.62720047	0	7		
10	2	0.00137005	0	0.1274144	0	7		
11	1	0.01337445	0	1.65843176	0	0		
12	2	0.00560863	0	0.52160264	0	0		
13	3	0.01651932	0	1.02419801	0	0		
14	4	0.01104347	0	0.34234771	0	7		
15	3	0.01005189	0	0.62321701	0	0		
16	4	0.01960604	0	0.60778714	0	7		
17	3	0.01638615	0	1.01594118	0	7		

Figure XIX. Monte Carlo Simulation – Airport Optimistic Six

Airport - Optimistic 6								
Parameters								
35	Arrival Rate (customers per hour)			150k cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
6	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	3			3	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	35	0.49295775				
	Service	-1	36	0.50704225				
	Loss	-1	0	0				
			Sum of rates					
			71					
0.01408451	E (Waiting time until next transition)							
0.01216382	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	4						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		14.1444948	0.14711378	95.6338857	0.49489219	96.2758917	246.951203	150.675311
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	3	0.01216382	0	1.13123506	0	0		
1	3	0.00643741	0	0.59867906	0	0		
2	4	0.00162213	0	0.1005723	0	7		
3	3	0.0092407	0	0.85938496	0	7		
4	2	0.00189156	0	0.23455395	0	7		
5	1	0.02574108	0	3.98986757	0	0		
6	2	0.00532681	0	0.66052427	0	0		
7	3	0.01373105	0	1.27698809	0	0		
8	4	0.01216168	0	0.75402406	0	0		
9	5	0.00550239	0	0.17057399	0	0		
10	6	0.0060132	0	0	0	0		
11	7	0.00651617	0.03258083	0	0	7		
12	6	0.00846166	0	0	0	7		
13	5	0.00121217	0	0.03757726	0	7		
14	4	0.02641758	0	1.63789024	0	0		
15	5	0.02188118	0	0.67831644	0	0		
16	6	0.00462866	0	0	0	0		
17	7	0.00743987	0.03719934	0	0	7		

Figure XX. Monte Carlo Simulation – Modern Pessimistic One

Modern - Pessimistic 1								
Parameters								
1.5	Arrival Rate (customers per hour)			5000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
1	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	1.5	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			1.5					
0.66666667	E (Waiting time until next transition)							
0.333866	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		345.393809	0.0239117	27.6747522	0.26346737	27.9621313	9.89015989	-18.071971
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.333866	0	10.3498461	0	0		
1	2	0.02525705	0.12628523	0	0	7		
2	1	0.04427927	0	0	0	7		
3	0	0.24430665	0	7.57350619	0	0		
4	1	0.092935	0	0	0	7		
5	0	0.11808564	0	3.6606548	0	0		
6	1	0.02752042	0	0	0	7		
7	0	0.25550945	0	7.92079295	0	0		
8	1	0.03147153	0	0	0	0		
9	2	0.0084737	0.04236851	0	7	0		
10	1	0.22189558	0	0	0	7		
11	0	0.34906883	0	10.8211339	0	0		
12	1	0.19303981	0	0	0	7		
13	0	1.10822412	0	34.3549476	0	0		
14	1	0.04828005	0	0	0	7		
15	0	0.18573244	0	5.75770558	0	0		
16	1	0.09015336	0	0	0	7		
17	0	0.9696336	0	30.0586416	0	0		

Figure XXI. Monte Carlo Simulation – Modern Pessimistic Two

Modern - Pessimistic 2								
Parameters								
1.5	Arrival Rate (customers per hour)			5000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
2	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	1.5	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			1.5					
0.66666667	E (Waiting time until next transition)							
0.34713266	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		360.347796	0.0010402	58.2565983	0	58.2576385	9.73226431	-48.525374
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.34713266	0	21.5222251	0	0		
1	2	0.01944933	0	0	0	7		
2	1	0.18078463	0	5.60432341	0	7		
3	0	0.88419476	0	54.820075	0	0		
4	1	0.00599324	0	0.18579054	0	7		
5	0	0.26684404	0	16.5443303	0	0		
6	1	0.11562305	0	3.58431452	0	7		
7	0	0.12807916	0	7.9409082	0	0		
8	1	0.06348639	0	1.96807811	0	0		
9	2	0.16657155	0	0	0	7		
10	1	0.12056032	0	3.73736996	0	7		
11	0	0.54515739	0	33.7997581	0	0		
12	1	0.07360444	0	2.28173753	0	7		
13	0	1.12505529	0	69.7534282	0	0		
14	1	0.09358685	0	2.90119232	0	7		
15	0	0.56552836	0	35.0627585	0	0		
16	1	0.20728388	0	6.42580035	0	7		
17	0	0.16864328	0	10.4558832	0	0		

Figure XXII. Monte Carlo Simulation – Modern Pessimistic Three

Modern - Pessimistic 3								
Parameters								
1.5	Arrival Rate (customers per hour)			5000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
3	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	2			2	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	1.5	0.05882353				
	Service	-1	24	0.94117647				
	Loss	-1	0	0				
			Sum of rates					
			25.5					
0.03921569	E (Waiting time until next transition)							
0.00657215	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		307.898391	0	88.9522428	0	88.9522428	11.3901212	-77.562122
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	2	0.00657215	0	0.20373677	0	0		
1	2	0.02072743	0	0.64255022	0	7		
2	1	0.0367021	0	2.27553021	0	7		
3	0	0.44824802	0	41.6870663	0	0		
4	1	0.02631021	0	1.63123298	0	7		
5	0	0.48521897	0	45.1253642	0	0		
6	1	0.16828831	0	10.4338754	0	7		
7	0	0.08231061	0	7.65488652	0	0		
8	1	0.07381746	0	4.57668239	0	7		
9	0	0.14564125	0	13.5446365	0	0		
10	1	0.02350669	0	1.45741468	0	7		
11	0	1.14156099	0	106.165172	0	0		
12	1	0.04346335	0	2.69472762	0	7		
13	0	0.44650443	0	41.5249119	0	0		
14	1	0.01572573	0	0.97499547	0	7		
15	0	0.06565036	0	6.10548393	0	0		
16	1	0.00961137	0	0.5959049	0	7		
17	0	1.05177503	0	97.815078	0	0		

Figure XXIII. Monte Carlo Simulation – Modern Optimistic One

Modern - Optimistic 1								
Parameters								
9	Arrival Rate (customers per hour)			38000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
1	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	9	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			9					
0.11111111	E (Waiting time until next transition)							
0.06654701	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		51.4612419	2.67052641	12.1407703	15.9148899	30.7261866	52.0974602	21.3712735
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.06654701	0	2.06295737	0	0		
1	0	0.09189205	0	2.84865344	0	0		
2	1	0.03532518	0	0	0	0		
3	2	0.03545652	0.17728258	0	0	7		
4	1	0.00146043	0	0	0	0		
5	2	0.07474239	0.37371197	0	7	0		
6	1	0.03004962	0	0	0	0		
7	2	0.00538236	0.02691178	0	0	0		
8	3	0.00011157	0.00111565	0	0	0		
9	4	0.08329061	1.2493592	0	7	0		
10	3	0.04884365	0.48843646	0	0	0		
11	4	0.02260573	0.33908602	0	7	0		
12	3	0.01769197	0.17691965	0	0	0		
13	4	0.02186527	0.32797903	0	0	0		
14	5	0.06275587	1.25511747	0	0	7		
15	4	0.01279788	0.19196822	0	0	0		
16	5	0.00090502	0.01810044	0	7	0		
17	4	0.05621003	0.8431504	0	0	0		

Figure XXIV. Monte Carlo Simulation – Modern Optimistic Two

Modern - Optimistic 2								
Parameters								
9	Arrival Rate (customers per hour)			38000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
2	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	9	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			9					
0.11111111	E (Waiting time until next transition)							
0.06714362	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		53.1680093	0.339404	39.7832437	2.63316234	42.7558101	63.3275544	20.5717443
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.06714362	0	4.16290433	0	0		
1	2	0.01452605	0	0	0	0		
2	3	0.01959607	0.09798036	0	0	7		
3	2	0.00357436	0	0	0	7		
4	1	0.01448017	0	0.44888513	0	0		
5	2	0.01758376	0	0	0	7		
6	1	0.05853166	0	1.81448151	0	0		
7	2	0.05259665	0	0	0	0		
8	3	0.00777718	0.03888589	0	7	0		
9	2	0.01448036	0	0	0	0		
10	3	0.04964261	0.24821304	0	0	0		
11	4	0.00259252	0.02592521	0	0	7		
12	3	0.03260276	0.16301378	0	0	7		
13	2	0.01779449	0	0	0	7		
14	1	0.05197098	0	1.61110024	0	7		
15	0	0.46350525	0	28.7373255	0	0		
16	1	0.1477345	0	4.57976938	0	7		
17	0	0.30423586	0	18.8626232	0	0		

Figure XXV. Monte Carlo Simulation – Modern Optimistic Three

Modern - Optimistic 3								
Parameters								
9	Arrival Rate (customers per hour)			38000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
3	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	2			2	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	9	0.27272727				
	Service	-1	24	0.72727273				
	Loss	-1	0	0				
			Sum of rates					
			33					
0.03030303	E (Waiting time until next transition)							
0.00184299	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	3						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		57.0755162	0.09886261	70.0223792	0.7358672	70.857109	60.7090436	-10.148065
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	2	0.00184299	0	0.0571328	0	0		
1	2	0.00910552	0	0.28227121	0	7		
2	1	0.18997761	0	11.7786116	0	7		
3	0	0.16843558	0	15.6645085	0	0		
4	1	0.05558791	0	3.4464502	0	0		
5	2	0.04030106	0	1.2493328	0	7		
6	1	0.0341647	0	2.11821156	0	7		
7	0	0.18336999	0	17.0534086	0	0		
8	1	0.0062446	0	0.38716529	0	0		
9	2	0.01834928	0	0.56882767	0	0		
10	3	0.02318928	0	0	0	7		
11	2	0.05518353	0	1.7106894	0	0		
12	3	0.03264643	0	0	0	7		
13	2	0.04889141	0	1.5156338	0	7		
14	1	0.07374091	0	4.57193621	0	7		
15	0	0.28634386	0	26.6299794	0	0		
16	1	0.02040652	0	1.26520424	0	7		
17	0	0.14651734	0	13.6261123	0	0		

Figure XXVI. Monte Carlo Simulation – Modern Optimistic Four

Modern - Optimistic 4								
Parameters								
9	Arrival Rate (customers per hour)			38000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
4	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	9	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			9					
0.11111111	E (Waiting time until next transition)							
0.01462938	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		58.8985537	0.00057539	101.113498	0	101.114073	59.543058	-41.571015
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.01462938	0	1.8140433	0	0		
1	2	0.00262056	0	0.16247483	0	7		
2	1	0.05456317	0	5.07437502	0	0		
3	2	0.00876165	0	0.54322212	0	7		
4	1	0.05680192	0	5.28257874	0	7		
5	0	0.07747445	0	9.60683138	0	0		
6	1	0.02464619	0	2.292096	0	7		
7	0	0.04298844	0	5.33056666	0	0		
8	1	0.10489545	0	9.75527664	0	7		
9	0	0.00978183	0	1.21294676	0	0		
10	1	0.00125479	0	0.11669514	0	7		
11	0	0.0724558	0	8.98451913	0	0		
12	1	0.01775065	0	1.65081002	0	7		
13	0	0.19375795	0	24.0259859	0	0		
14	1	0.01237183	0	1.15058047	0	7		
15	0	0.05060914	0	6.27553336	0	0		
16	1	0.00021563	0	0.02005354	0	7		
17	0	0.27728752	0	34.383652	0	0		

Figure XXVII. Monte Carlo Simulation – Minimalist Pessimistic One

Minimalist - Pessimistic 1								
Parameters								
1.5	Arrival Rate (customers per hour)			5400 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
1	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	1			1	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	1.5	0.11111111				
	Service	-1	12	0.88888889				
	Loss	-1	0	0				
			Sum of rates					
			13.5					
0.07407407	E (Waiting time until next transition)							
0.00930859	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	0						
			Average costs/hr in simulation					
		Total time si	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		338.641706	0.05989406	27.1952715	0.59945363	27.8546192	9.75662461	-18.097995
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	1	0.00930859	0	0	0	0		
1	3	0.04571115	0.45711148	0	0	7		
2	2	0.14061728	0.7030864	0	7	0		
3	1	0.06028033	0	0	0	0		
4	2	0.08624085	0.43120426	0	0	7		
5	1	0.05737251	0	0	0	7		
6	0	0.23706596	0	7.34904489	0	0		
7	1	0.09898556	0	0	0	7		
8	0	1.51214495	0	46.8764933	0	0		
9	1	0.17498314	0	0	0	7		
10	0	0.75349448	0	23.3583288	0	0		
11	1	0.03717648	0	0	0	7		
12	0	0.7465688	0	23.1436328	0	0		
13	1	0.01459142	0	0	0	7		
14	0	0.65081742	0	20.17534	0	0		
15	1	0.01434136	0	0	0	7		
16	0	0.12089715	0	3.74781163	0	0		
17	1	0.01350743	0	0	0	7		

Figure XXVIII. Monte Carlo Simulation – Minimalist Pessimistic Two

Minimalist - Pessimistic 2								
Parameters								
1.5	Arrival Rate (customers per hour)			5400 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
2	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	1			1	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	1.5	0.11111111				
	Service	-1	12	0.88888889				
	Loss	-1	0	0				
			Sum of rates					
			13.5					
0.07407407	E (Waiting time until next transition)							
0.07008629	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	0						
			Average costs/hr in simulation					
		Total time si	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		338.200677	0.00207733	58.299342	0	58.3014193	10.369583	-47.931836
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	1	0.07008629	0	2.17267494	0	0		
1	3	0.02265066	0.1132533	0	0	7		
2	2	0.02951375	0	0	0	7		
3	1	0.04931496	0	1.52876374	0	7		
4	0	0.35828312	0	22.2135535	0	0		
5	1	0.04401932	0	1.3645988	0	7		
6	0	0.62143395	0	38.5289048	0	0		
7	1	0.13523685	0	4.19234239	0	7		
8	0	1.81998198	0	112.838882	0	0		
9	1	0.05662691	0	1.75543419	0	7		
10	0	0.25731521	0	15.953543	0	0		
11	1	0.00376374	0	0.11667588	0	7		
12	0	0.9844065	0	61.0332027	0	0		
13	1	0.03279375	0	1.01660631	0	7		
14	0	2.26730107	0	140.572667	0	0		
15	1	0.07284976	0	2.2583425	0	7		
16	0	0.29730274	0	18.4327698	0	0		
17	1	0.05144129	0	1.59468011	0	7		

Figure XXIX. Monte Carlo Simulation – Minimalist Pessimistic Three

Minimalist - Pessimistic 3								
Parameters								
1.5	Arrival Rate (customers per hour)			5400 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
3	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	1.5	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			1.5					
0.66666667	E (Waiting time until next transition)							
0.19235382	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time si	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		298.834079	0	88.5160248	0	88.5160248	8.69044122	-79.825584
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.19235382	0	17.8889055	0	0		
1	3	0.02598305	0	0	0	7		
2	2	0.07473651	0	2.31683172	0	7		
3	1	0.05398699	0	3.34719332	0	7		
4	0	0.35415813	0	32.9367057	0	0		
5	1	0.04136349	0	2.56453615	0	7		
6	0	0.12739196	0	11.8474526	0	0		
7	1	0.07793743	0	4.83212068	0	7		
8	0	0.65323646	0	60.7509903	0	0		
9	1	0.0426297	0	2.64304157	0	7		
10	0	0.75919834	0	70.6054455	0	0		
11	1	0.0678475	0	4.20654494	0	7		
12	0	0.45353788	0	42.1790231	0	0		
13	1	0.03011048	0	1.86684963	0	7		
14	0	0.26681816	0	24.8140891	0	0		
15	1	0.1562353	0	9.6865883	0	7		
16	0	1.54004807	0	143.22447	0	0		
17	1	0.01304883	0	0.80902764	0	7		

Figure XXX. Monte Carlo Simulation – Minimalist Optimistic One

Minimalist - Optimistic 1								
Parameters								
7	Arrival Rate (customers per hour)			30000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
1	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	7	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			7					
0.14285714	E (Waiting time until next transition)							
0.08958218	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		75.6020495	1.08495935	16.2708621	5.37022478	22.7260462	40.9248164	18.1987702
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.08958218	0	2.77704753	0	0		
1	0	0.04899809	0	1.51894094	0	0		
2	1	0.08126783	0	0	0	0		
3	2	0.01111565	0.05557827	0	0	0		
4	3	0.02957409	0.29574094	0	0	7		
5	2	0.07772243	0.38861215	0	0	7		
6	1	0.03445153	0	0	0	0		
7	2	0.03971768	0.19858838	0	0	7		
8	1	0.03040412	0	0	0	0		
9	2	0.09670346	0.4835173	0	7	0		
10	1	0.05637155	0	0	0	7		
11	0	0.00168739	0	0.05230896	0	0		
12	1	0.00743596	0	0	0	7		
13	0	0.00620066	0	0.19222031	0	0		
14	1	0.02978518	0	0	0	7		
15	0	0.16758156	0	5.19502822	0	0		
16	1	0.01344276	0	0	0	0		
17	2	0.04611027	0.23055136	0	0	7		

Figure XXXI. Monte Carlo Simulation – Minimalist Optimistic Two

Minimalist - Optimistic 2								
Parameters								
7	Arrival Rate (customers per hour)			30000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
2	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	2			2	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	7	0.22580645				
	Service	-1	24	0.77419355				
	Loss	-1	0	0				
			Sum of rates					
			31					
0.03225806	E (Waiting time until next transition)							
0.01000523	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		70.2396924	0.30415189	42.269742	1.69419876	44.2680927	48.1351766	3.86708393
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	2	0.01000523	0	0	0	7		
1	0	0.19052375	0	11.8124724	0	0		
2	1	0.01223231	0	0.37920162	0	7		
3	0	0.07531274	0	4.66938971	0	0		
4	1	0.009012	0	0.27937201	0	0		
5	2	0.04367835	0	0	0	7		
6	1	0.0584267	0	1.81122777	0	7		
7	0	0.1131795	0	7.01712895	0	0		
8	1	0.1223319	0	3.79228881	0	0		
9	2	0.05725155	0	0	0	7		
10	1	0.08630847	0	2.67556268	0	0		
11	2	0.00350964	0	0	0	7		
12	1	0.0366241	0	1.13534698	0	7		
13	0	0.0728234	0	4.51505102	0	0		
14	1	0.0324994	0	1.00748127	0	0		
15	2	0.03716603	0	0	0	0		
16	3	0.02483226	0.12416128	0	0	7		
17	2	0.05399916	0	0	0	0		

Figure XXXII. Monte Carlo Simulation – Minimalist Optimistic Three

Minimalist - Optimistic 3								
Parameters								
7	Arrival Rate (customers per hour)			30000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
3	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	2			2	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	7	0.22580645				
	Service	-1	24	0.77419355				
	Loss	-1	0	0				
			Sum of rates					
			31					
0.03225806	E (Waiting time until next transition)							
0.00526915	Simulated waiting time until next transition (Duration)							
Service	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		66.6356711	0.00935407	74.2002714	0	74.2096255	28.5732847	-45.636341
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	2	0.00526915	0	0.1633438	0	7		
1	0	0.0690802	0	6.42445905	0	0		
2	1	0.00921488	0	0.57132277	0	7		
3	0	0.08406132	0	7.8177024	0	0		
4	1	0.16305409	0	10.1093537	0	7		
5	0	0.11953007	0	11.1162964	0	0		
6	1	0.07075946	0	4.38708677	0	7		
7	0	0.0575892	0	5.35579538	0	0		
8	1	0.05428564	0	3.36570965	0	7		
9	0	0.04274656	0	3.97542993	0	0		
10	1	0.04484509	0	2.78039579	0	7		
11	0	0.03585014	0	3.33406259	0	0		
12	1	0.02853592	0	1.76922688	0	7		
13	0	0.04656237	0	4.33030084	0	0		
14	1	0.0059411	0	0.36834836	0	7		
15	0	0.05820516	0	5.41307979	0	0		
16	1	0.04273954	0	2.64985148	0	7		
17	0	0.07182935	0	6.68012909	0	0		

Figure XXXIII. Monte Carlo Simulation – Minimalist Optimistic Four

Minimalist - Optimistic 4								
Parameters								
7	Arrival Rate (customers per hour)			30000 cust/350days/12 hrs				
12	Service Rate (customers per hour) per E			5 min/book				
4	# of EBMs							
0.25	E (Time willing to wait in hours) for a customer in the queue							
5	Q'd customer waiting costs ($/hr)							
31	Idle EBM costs ($/hr)			130k/350days/12hrs				
7	Cost of losing a customer ($)			Gross profit				
	# Customers in System				In Service	In Queue		
	STATE	0			0	0		
	Transitions	# change	Rate	Probability				
	Arrival	1	7	1				
	Service	-1	0	0				
	Loss	-1	0	0				
			Sum of rates					
			7					
0.14285714	E (Waiting time until next transition)							
0.28705519	Simulated waiting time until next transition (Duration)							
Arrival	Next transition							
		# of Customers in System						
	Update	1						
			Average costs/hr in simulation					
		Total time sir	Queue	Idle	Lost	Total Cost/h	Total Gross P	Difference
		74.2974357	0.00344617	106.094922	0	106.098368	47.1079515	-58.990417
			Costs:					
Output	# In System	Duration	Queue	Idle	Lost	Paid		
Iterations (C	0	0.28705519	0	35.5948438	0	0		
1	0	0.0655994	0	8.13432612	0	0		
2	1	0.01124999	0	1.04624904	0	0		
3	2	0.0080458	0	0.49883959	0	7		
4	1	0.00079856	0	0.07426629	0	0		
5	2	0.00639548	0	0.39651999	0	7		
6	1	0.00061062	0	0.05678798	0	7		
7	0	0.05714538	0	7.0860271	0	0		
8	1	0.00038757	0	0.03604416	0	0		
9	2	0.00746684	0	0.46294436	0	7		
10	1	0.2346269	0	21.8203015	0	7		
11	0	0.21040673	0	26.0904339	0	0		
12	1	0.05338959	0	4.96523188	0	0		
13	2	0.07382021	0	4.57685289	0	7		
14	1	0.02317971	0	2.15571308	0	7		
15	0	0.02903591	0	3.60045341	0	0		
16	1	0.01657327	0	1.54131385	0	7		
17	0	0.08681751	0	10.7653711	0	0		

Figure XXXIV. Projected Operating Profit after Statistical Analysis

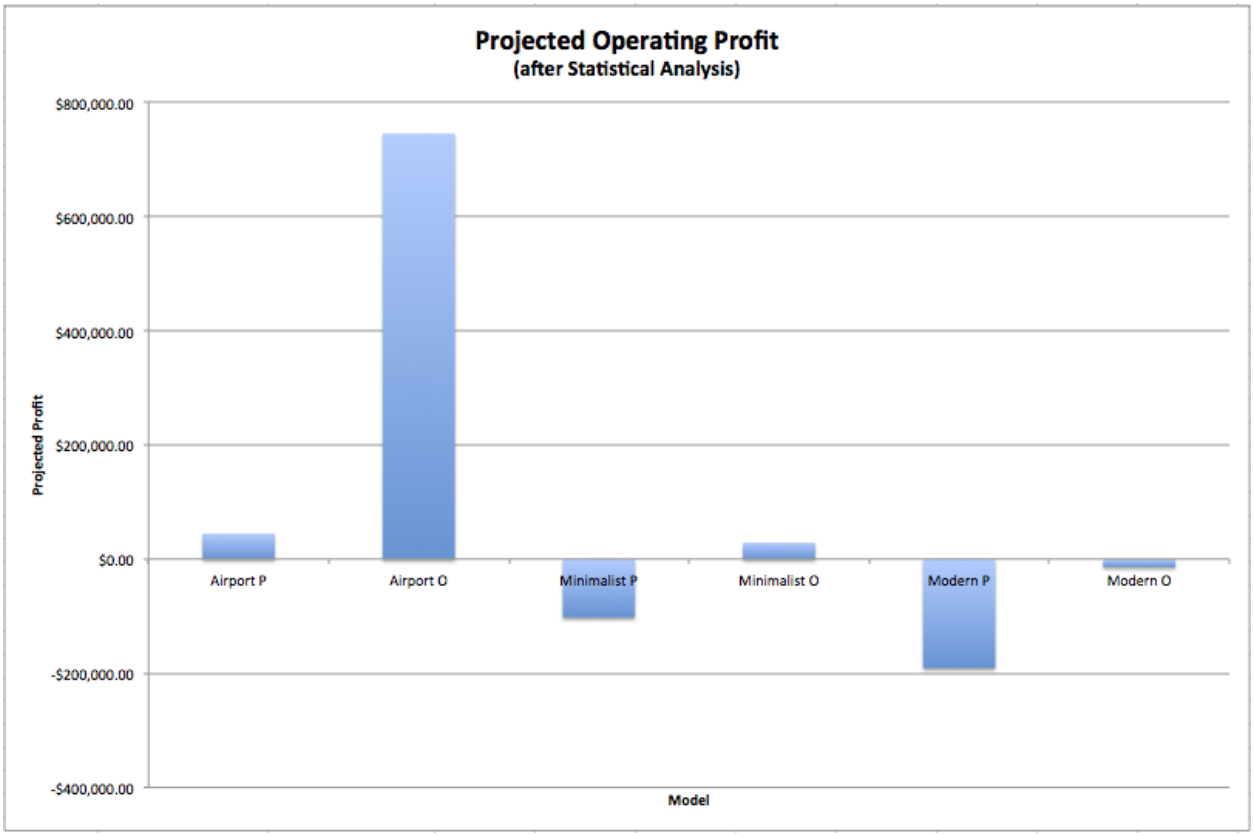


Table XXIII. Projected Financials for all Models

MODEL	Revenue/year	Gross Profit/hour	Gross Profit/year	Operating Costs/year	Operating Profit
Airport P	$562,525.20	$62.50	$262,511.76	$217,840.00	$44,671.76
Airport O	$2,252,104.21	$250.23	$1,050,981.96	$305,360.00	$745,621.96
Modern P	$89,011.44	$9.89	$41,538.67	$232,359.96	-$190,821.29
Modern O	$468,877.14	$52.10	$218,809.33	$232,359.96	-$13,550.63
Minimalist P	$87,809.62	$9.76	$40,977.82	$143,139.96	-$102,162.14
Minimalist O	$368,323.35	$40.92	$171,884.23	$143,139.96	$28,744.27